MTM

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The Journal of Methods-Time Measurement

MTM ASSOCIATION FOR STANDARDS AND RESEARCH

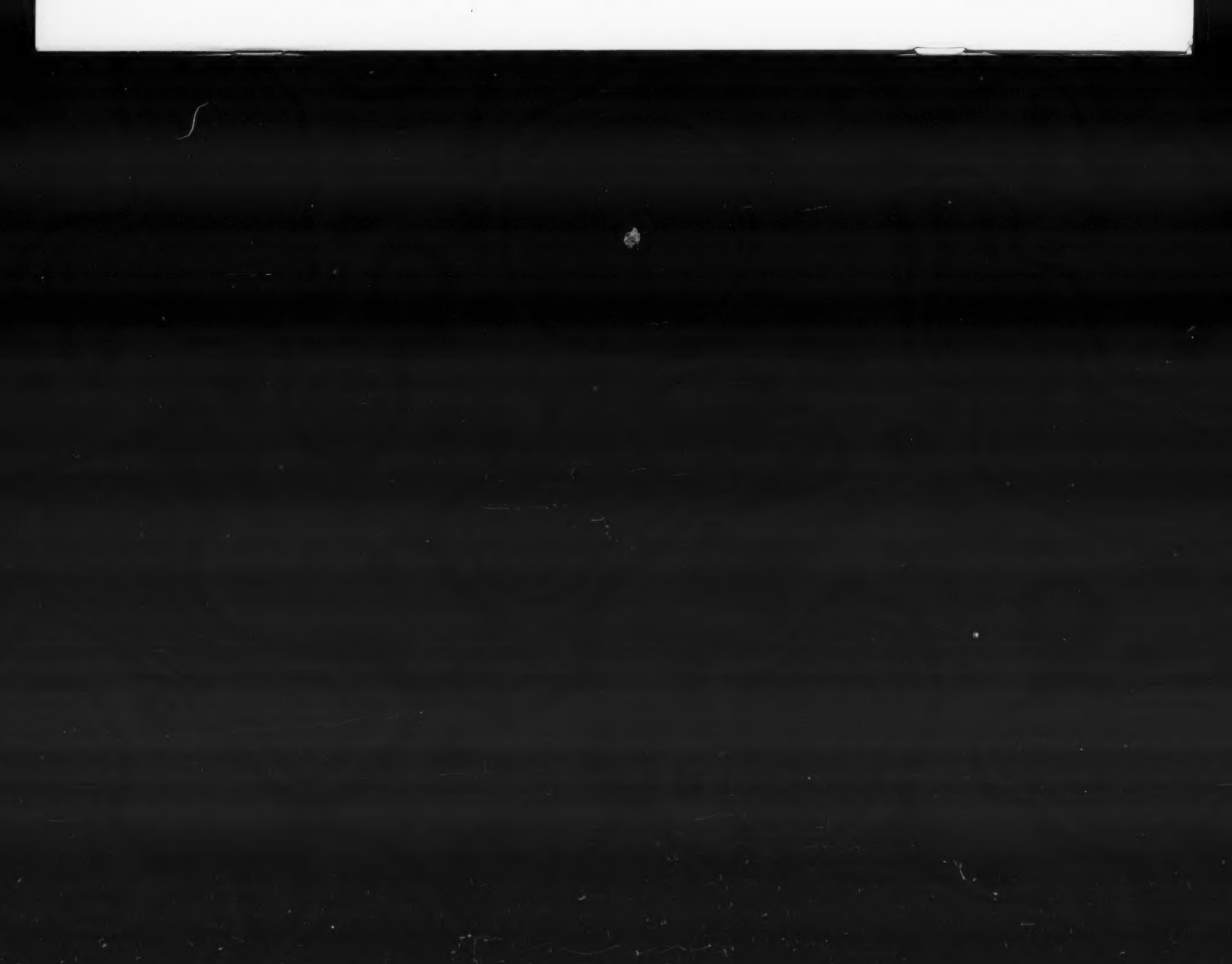
July-
October

1957

Vol. IV
No. 3 & 4

In This Issue . . .

International MTM Directorate
Air Material Command's Improvement Program
MTM at Volvo, Skövde, Sweden
Application Studies:
Foundry Molding,
Bundling Data



MTM

The Journal of Methods-Time Measurement

July - October 1957

MTM ASSOCIATION FOR STANDARDS AND RESEARCH

The Journal of Methods-Time Measurement is dedicated to the technical aspects, application developments and general news items concerning the advancement of MTM.

The Journal encompasses the fields of endeavor that were formerly publicized in the MTM Newsletter and MTM Bulletin.

The technical section of the Journal is concerned chiefly with recent research developments both from the established research program at the University of Michigan, Ann Arbor, Michigan, and from somewhat smaller allied projects being conducted throughout the Association membership.

New applications of MTM as well as refinements of established applications are presented in the Application Section to illustrate specific approaches to management problems that can be solved through the use of Methods-Time Measurement.

Current events in the lives of persons associated with MTM are described in the general news section.

The Editorial Staff welcomes contributions for all three sections described.

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The Journal of Methods-Time Measurement

July - October 1957

Publisher

MTM Association

Editor..... Richard F. Stoll

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MTM Association Officers: 1957

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Editor's Note:

The Association has tried in every way possible to check the veracity of material published in the Journal of Methods Time Measurement. However, the opinions of the authors are not necessarily the opinions of the Association. The Association, therefore, will not be held responsible for any liability which may develop from any material in this publication.

Dr. H. B. Maynard made Chairman-General of the International Directorate in Paris, June, 1957, and an Honorary Member, MTM Association, October, 1957.

INTERNATIONAL MTM DIRECTORATE PERSONNEL

Left to Right: Donald Farr, U.S., Director of Chapter Development; Holger Bohlin, Sweden, Director of Research; Richard F. Stoll, U.S., Secretary; Ir. Rudde Volz, Holland, Chairman in Europe; Walter Wetter, Switzerland, Representative; Verner Haag, Switzerland, Representative.

Directorate Officers not in the above photo: Dr. H. B. Maynard, U.S., Chairman-General; Serge A. Birn, U.S., Chairman in Americas; M. Lambert, France, Director of Public Relations; Prof. W. Daenzer, Switzerland, Director of Training; Ir. W. B. Rueb, Holland, Director of Qualifications.

FEATURE

INTERNATIONAL MTM DIRECTORATE MEETING
NATIONAL MTM ASSOCIATION PARTICIPANTS

Paris, France
June 25, 26, 27, 1957

Australia

Mr. Jeff Peterson
Mr. Ron Derrick

France

Mr. Lambert
Mr. Lemaresquier
Mr. Vioujard
Mr. Cazals
Mr. Gauchet
Mr. Cordier
Mr. Soumagnac
Mr. Franck
Mr. Le Cogniec
Mr. Chantal
Mr. Mottet
Mr. Albingre
Mr. Muel
Mr. Pelissollo
Mr. Rioux
Mr. Lapoirie
Mr. Pagesy

Great Britain

Mr. Ph. Glassey

Netherlands

Mr. R. F. Volz
Mr. A. Strachoff
Mr. W. B. Rueb
Mr. F. Kossen
Mr. G. H. P. Veldkamp
Mr. G. H. Vloedbled
Mr. A. W. Berenschot
Dr. D. Aorringa
Mr. C. J. Bethe

Spain

Mr. Robert N. Clyman

Sweden

Mr. Holger Bohlin

Switzerland

Mr. Verner Haag
Mr. Walter Heibeisen
Mr. Otto Martz
Mr. Walter Wetter

United States

Dr. H. B. Maynard
Mr. S. A. Birn
Mr. Donald Farr
Mr. James A. Gage
Mr. David Raphael
Mr. Richard F. Stoll

INTERNATIONAL MTM MEETINGS

Paris, France, June 1957

International MTM meetings were planned for the summer of 1957 in Paris, France. M. Lambert, President, MTM Association of France made the arrangements to have a luncheon and assembly Tuesday, June 25 in Paris. Mr. Donald Farr, International Service Committee Chairman, U.S. Association, chaired the assembly meeting which resulted in the formation of an International Directorate, whose officers including Messrs. Lambert and Farr appear in the feature preceding this report.

At the assembly meeting, Plenary Sessions covering various aspects of MTM application were planned and conducted on June 26th and 27th.

The formation of an International Directorate to coordinate research and standards for training and qualifications has been hoped for some time now among those close to MTM development throughout the world.

Active Associations have existed in Europe, in France, Holland, Sweden and Switzerland, and in the United States for some time. There has been, however, no organized attempt to coordinate the work of these Associations until now.

The Directorate with active chairmen in Europe and the United States working under the guidance of Dr. Maynard should be able to standardize the technique and build the research efforts toward a common goal.

Four basic tenets were held by the assembly in Paris to be paramount in the action of a directorate, as follows:

1. To spread the sound usage of MTM through appropriate public relations channels, encouragement to national groups, and suitable assistance where needed.

2. To encourage and coordinate National Cooperative MTM Research Programs.

3. To strive for maintaining uniformity in MTM application through approval of training courses and examination procedures and through the use of Universal Data Cards.

4. To encourage the spirit of competitive enterprise in the dissemination of MTM training and application by assisting several sources to become qualified in each country.

Two basic objectives were set forth in concluding the meetings as follows:

1. To establish status of four Director classifications and to obtain National Association representation for the assignments. (This objective has been met.)

2. To stimulate the second European MTM Conference just previous to the CIOS Congress in Berlin, 1958.

INTERNATIONAL MTM DIRECTORATE

General Directors' Report to National Associations

After the Paris conference, the general directors had discussions and correspondence with representatives of all national associations.

These contacts have resulted in the following appointments:

1. Mr. H. Bohlin, representative of Svenska MTM Foreningen has been appointed to be director of Research Coordination.

2. Mr. W. B. Rueb, representative of Nederlands-MTM-Genootschap has been appointed to be Director of Qualifications Coordination.

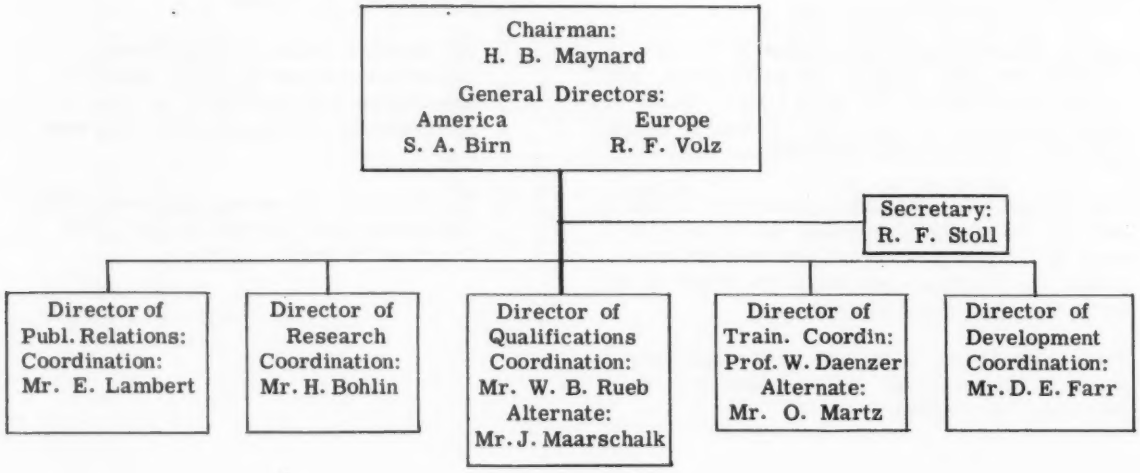
3. Prof. W. Daenzer, representative of the Swiss MTM Association has been appointed to be Director of Training Coordination.

4. Mr. E. Lambert, representative of Association MTM Francaise has been appointed to be Director of Public Relations Coordination.

5. Mr. D. E. Farr, representative of MTM Association for Standards and Research (USA) has been appointed to be Director of Chapter Development Coordination.

The Netherlands and the Swiss Associations have designated an alternate to the director. The other associations are requested to do the same.

The organization of the Directorate now is as follows:


Chairman:
H. B. Maynard
General Directors:
America
S. A. Birn
Europe
R. F. Volz
Secretary:
R. F. Stoll
Director of Publ. Relations: Coordination: Mr. E. Lambert
Director of Research Coordination: Mr. H. Bohlin
Director of Qualifications Coordination: Mr. W. B. Rueb Alternate: Mr. J. Maarschalk
Director of Train. Coordin: Prof. W. Daenzer Alternate: Mr. O. Martz
Director of Development Coordination: Mr. D. E. Farr

AMC'S IMPROVEMENT PROGRAM PAYS DIVIDENDS

Reprint from:
NAMAE BEACON

An Air Materiel Command management tool, the Grass Roots Improvement Program (GRIP), is increasing the operational efficiency within echelons in Burtonwood's Supply Group, and in local British industry.

Last week a fourteen-man class of military and civilian supervisors from Burtonwood, and representatives from Imperial Chemical Industries (ICI) and British Aluminium graduated from the eleven week course held here.

The AMC Supply GRIP is "a program designed to promote the use of more scientific and precise management through the utilization of engineering methods within the echelons of supply.

"It is intended to provide the basic tools through which managers may measure, coordinate, predict, analyze, make sound decisions, and remain aware of the efficiency and cost of operations. GRIP will promote the lowest cost per unit of production consistent with acceptable quality and military criteria."

Members of the newly organized Industrial Engineering Division of the 3111th Supply Group this week entered various organizations within the Directorate of Supply and Services, keeping sharp and well-trained eyes peeled. Their purpose? To establish engineered time standards and provide assistance to those organizations in the field of methods analysis; to define a "fair day's work".

* * * * *

MEMBERS of the graduating class will assume the position of Production Standards Specialists. They are men trained to "get down to the grass roots" of industry, using techniques now being developed in what is now considered to be the newest and most important medium to assist both labor and management.

The course was not easy. The Burtonwood class, instructed by experts in the field, met for 480 hours over a twelve week period. Study and work was not confined to areas on base; one week of study was held at the Pilkington-Sullivan Works of ICI at Widnes. There, a Work-Study course given ICI supervisors, became an integral part of Burtonwood's schoolroom studies.

The overall course was divided into two sections. The first consisted of detailed study on GRIP itself; Basic time-study and stopwatch techniques (to measure work and output); use and manipulation of the slide rule; fundamentals of statistics; and production count techniques.

* * * * *

Students in NAMAE'S newest school, the AMC Supply Grass Roots Improvement Program (GRIP) graduated last week after 480 hours of studying new management techniques. Burtonwood supervisors and men from local British industry participated in this, the Air Force's newest school. Here, Mr. Harold Tierney instructs the class in the fundamentals of Methods-Time Measurement.

THIS PORTION of the GRIP school was taught by 1/Lt. E. R. Roth, acting Engineering Division Chief; Lt. Jacques E. Linder, Hq. AMC Systems Engineer; and Mr. George James, DAFC.

But the meat of the course (for British engineers at least) came with the introduction of Methods Engineer Mr. Harold J. Tierney, a qualified Methods-Time Measurement instructor. One of seven licensed instructors of MTM currently employed by the Air Force. Tierney headed a five-week course on the fundamentals of MTM, the modern and much simplified method of determining engineered time standards.

MTM is sought after and utilized by industry throughout the world. Big business, small business, all practical-minded producers are now seeking methods of lowering cost and increasing production. And MTM is helping them. "Exploding a lot of unscientific dogma" one magazine article said.

One major obstacle stands in the way of the rapid growth of MTM techniques; few are qualified to teach it. Only certified graduates of the MTM Association Headquarters in Ann Arbor, Michigan, and in most instances, where teachers are not available, engineers from firms in England and other countries must travel to Michigan to take the course.

Here, the Burtonwood school stepped in an offered, as one visitor said, "the chance of a lifetime". English engineers were students in the MTM course. They were: Mr. Ronald Perry, Hillhouse Works, Blackpool; Mr. Joseph McWilliams, Work Study Officer at the Wilton Works, Middlesbrough; and Mr. John Rousseau —these gentlemen are employed by Imperial Chemical Industries Ltd. Fourth visiting student was Mr. Jack Leigh, Work Study Officer at British Aluminium's Bank Quay Works.

3111th SUPPLY GROUP personnel attending were: M/Sgt's Donald Pinkston, Emergy Lepine. John Felts, and Edward Case; T/Sgt's Robert Cave, William Eppler; and DAFC's Edward Hassing, Percy Daniels, Samuel DeLuca, and in the second course, UK Chief Training Officer Mr. Joseph Totten.

Now the graduates of the "Grass Roots" class are working in the lowest levels of supervision within their respective areas; providing management at that level with factual data on their everyday operation, through these up-to-date techniques. Authorities believe this GRIP school heralds a new era here at Burtonwood; greater efficiency and increased standards will be implemented by these graduates who are now looking closely at NAMAE's industrial "Grass Roots".

'CHOP BOX' AXES DOCUMENT TIME LAG

Burtonwood Paves the Way

Reprint from:
NAMAE BEACON

FOURTEEN men recently completed a 480 hour course in GRIP, through which many instructors taught them vast knowledge of industrial and military altertness. A qualified Methods Time Measurements Instructor, Mr. Harold J. Tierney, headed a five-week course on the fundamentals of MTM, the modern and simplified method of determining engineered time standards. MTM simply seeks ways of lowering cost and increasing production for businesses throughout the world.

Lessons learned through GRIP and MTM have now paid off handsomely for the Documents Control Section of Directorate Supply. Their first step in processing requisitions from customers through the Supply Depot used to present quite a problem.

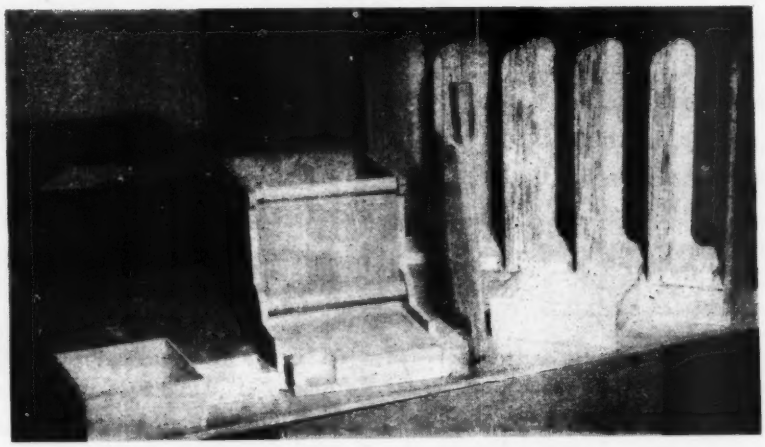
OPERATORS in the past had to tear off a continuous roll of seven Shipping Documents copies, match, and finally clip IBM Requisition Cards and AF Transaction Cards to them. The slow and painstaking job of tearing had to be done primitively with the edge of a ruler. Personnel in the office handled a tremendous number of cards per day in this antiquated punch card requisitioning system.

This contraption lets the operator tear off, match, and clip four times quicker than before, consequently clearing documents swiftly into the commodity divisions and thereby expediting customer service. Mr. Peter Heyes, Chief of Documents Control, explained the new gimmick has no official name as yet, so "chop box" currently serves the purpose.

OFFICE members, recalling the old method, concur with Mr. Heyes in his endorsement of the new gadget as a great boon for their section.

MTM, sought after all over the globe, has only its limited number of instructors as a handicap. Document Control's new device is heralded at Burtonwood as a new era of greater performance, efficiency, and more productive operational techniques for the military through GRIP classes and MTM training.

Military and industrial waste and inefficiency can be corrected and removed through MTM, which is spreading rapidly world-wide.



"Chop Box" in person. The unusual looking contraption is a welcome friend to personnel of Documents Control. It means speedier, more efficient work for them as well as an improved manner of processing requisitions.

Old fashioned means of tearing required ruler and patience. Mr. Heyes, Documents Control Chief, stages a drama which his office has now brushed off as complicated and unweildy. Modern ways have taken over. In the picture right, Merian Griffiths demonstrates the pride of the office as she processes requisition cards through the "Chop Box". Simplification of an entire process has been achieved through the efforts of those who invented the new apparatus.

WORK MEASUREMENT METHODS ANALYSIS CHART

REFERENCE NR. ___ — ___

PART: AF Forms 104P-1, 104P-3 and 224 | DATE: 7 May 1957 | STUDY NR: 2

OPERATION: Correlating | ANALYST: Mr. H.J. Tierney | PAGE 1 OF 2 PAGES

DESCRIPTION - LEFT HAND	NR	LH	TMU	RH	NR	DESCRIPTION - RIGHT HAND
1. Compare AF Forms						
224 and 104P-1						
Reach to 104P-1 card		(R2B)	6.8	T12O		Reach to form 224 card
				~~R2A~~		
Contact card		G5		G5		Contact Card
Card into time stamp		M6C	10.3	(M6B)		
Complete grasp		~~G1A~~				
		~~T30~~				
Bring 104P-1 and 224		M8C	11.8	(M2C)		
together			5.6	G2		Regrasp to include both cards
			3.4	M1C		Align cards
			14.6	EF	2	
Total			52.5			
2. Compare 104P-1 with						
104P-3						
Move cards to 104P-3		M8C	11.8	M8C		Move cards to 104P-3
Compare part number	2	EF	14.6			
			5.6	ET.16 (6)		Eyes to 14 digit number
withdraw fingers		(R2E)	14.6	EF		compare 14 digit number
Move to align		M1C	3.4	M1C		
Align left end of cards		P1SE	5.6			
			5.6	P1SE		Align right end of cards
			2.0	RL1		Release cards
			8.6	R6B		Reach to left end of assembly
			2.0	G1A		Grasp Assembly
Total			73.9			

NR	ELEMENT DESCRIPTION	ELEMENT TIME TMU	CONVERSION FACTOR .0006 LEVELED TIME	% ALLOWANCE	ELEMENT TIME ALLOWED	OCCURRENCES PER PIECE OR CYCLE	TOTAL TIME ALLOWED
1.	Compare AF Forms 104P-1 & 224	52.5	.0315	15%	.0362	1	.0362
2.	Compare AF Form 104P-1 & 104P-3	73.9	.0443	15%	.0510	1	.0510
3.	Install Paper Clip	36.6	.0220	15%	.0254	1	.0254
4.	Tear off and Aside	104.3	.0626	15%	.0720	1	.0720
						TOTAL	.0185

AMC FORM 19 MAY 55 142AL (REPRODUCED BY PERMISSION OF THE METHODS ENGINEERING COUNCIL) AF-WP-O-9 MAY 56 20,600

WORK MEASUREMENT METHODS ANALYSIS CHART						REFERENCE NR.
PART: AF Forms 104P-1, 104P-3 and 224			DATE: 7 May 1957			STUDY NR: 2
OPERATION: Correlating			ANALYST: H.J. Tierney			PAGE 2 OF 2 PAGES
DESCRIPTION - LEFT HAND	NR	LH	TMU	RH	NR	DESCRIPTION - RIGHT HAND
3. Install Paper Clip						
Reach to clips		R2B	4.0			
Contact clips		G5	0.			
Slide one to tray edge		M1B	2.9			
Grasp Clip		G1A	2.0			
Regrasp clip on	2	G2	11.2	(M2B)		Pull forms forward
Move to forms		~~T90~~				
Move clip end to forms		M1C	3.4			
Press to open clip		AP2	10.6			
Move clip on		M1A	2.5			
Relax Grasp		~~RL2~~				
Release clip		RL2	0.0			
Total			36.6			
4. Tear-Off and Aside						
Reach to holder		R16A	11.4	(M2B)		Pull forms forward
Grasp handle		G5	0			
Bring holder to forms		M16B	15.8			
			2.0	MfC		Move to position
			11.2	PISE	2	Position left & right sides
Move holder down		MfA	2.0			
Press down handle		AP1	16.2	AP1		Tighten Grasp
			13.4	M12B		Tear off 104P-3
			7.5	D2E		
			5.4	T90		Turn to bring 104P-3 up
			5.6	G2		and change grasp
			11.8	M8C		Place forms in rack
			2.0	RL1		Release

NR	ELEMENT DESCRIPTION	Total 104.3 ELEMENT TIME TMU	CONVERSION FACTOR .0006 LEVELED TIME	% ALLOWANCE	ELEMENT TIME ALLOWED	OCCURRENCES PER PIECE OR CYCLE	TOTAL TIME ALLOWED
3.	Install paper clip	36.6	.0220	15%	.0254	1	.0254
4.	Tear off and Aside	104.3	.0626	15%	.0720	1	.0720
						TOTAL	

AMC FORM 19 MAY 55 142AL (REPRODUCED BY PERMISSION OF THE METHODS ENGINEERING COUNCIL) AF-WP-O-9 MAY 56 20,600

The annual meeting of the Swedish MTM Association was held in Skövde, Sweden on May 28, 1956. The members of the Association made a tour of AB Volvo Pentaverken's foundry and engine plant, where the MTM procedure is being applied. Before the annual meeting was held, Mr. Evan Edman, Superintendent of the Foundry gave a report on several practical MTM applications which were later observed during the tour. This part of the program was introduced by Mr. Per Söderström, Managing Director of AB Volvo Pentaverken, who gave the following speech.

MTM AT OUR PLANT IN SKÖVDE

by

Per Söderström, Managing Director
AB Volvo Pentaverken

We who have been working with the MTM procedure for several years are convinced that we have obtained an extraordinary means for dealing with problems that affect the profitableness and competitiveness of the enterprises as well as the industrial relations and the general manufacturing problems in industry.

We believe that with this new tool we have obtained greater possibilities for developing good production techniques and manufacturing methods. The development of better and better manufacturing methods is probably the most important way to improve the competitive position for our industry and improve the living standard of our people. If the MTM procedure is a means which will assist us in this respect, then this method is worth all the support and all the help we can give it.

We believe that with the MTM procedure we have obtained a valuable tool for establishing incentive standards in industry. Anyone, who has had experience in setting incentive standards, knows how often this leads to arguments and grievances - also the unnecessary loss of time. Here in Skövde we are convinced that the MTM procedure will be very valuable to us and help us solve our piece rating problems. We also believe that the MTM procedure will solve certain incentive problems which previously could not be solved by the conventional time-study procedure. If wage incentives could be expanded to cover such occupations as maintenance work, jobbing work etc. this would be a great advancement. This problem is receiving more and more attention in industry today. The more we mechanize, more "maintenance" people are required. If we install wage incentives for these servicing occupations we would be able to solve the efficiency and wage problem for another important group of our working force.

These viewpoints I have just mentioned have made it clear that we need an organization which can help us introduce this new tool to our industry in the best possible way. We are convinced that MTM can be a very valuable aid if all those who are using it will use it the correct way. Should it be used in the wrong way I am sure that we will create new problems and we will not obtain the full benefit of the procedure. It's up to us in industry to learn about the MTM procedure and how we are going to apply it to our work. I believe that the Association will be of great significance in this respect if it succeeds in fulfilling its purpose correctly. Because so many of us, representing a large number of enterprises have attended this meeting, this can also be taken as an expression that my expectations of the Association are shared by many people.

The principles of the MTM Association state that the purpose of the Association is

to encourage the correct application of MTM

to encourage the technical development of MTM

to broaden the knowledge of MTM

The activity of the Association up to this time has naturally been limited to starting achievements of various kinds. We have first of all attended to acquiring members, which has given good results, but it has also taken a great deal of time. Besides this we have concentrated on the own organization, acquired a staff etc. We have also been busy with a lot of administrative details and other questions which have been time consuming. The secretary of the Association up to this time has only been engaged on a half-time basis. Because of this it has not been possible for us to show strong activity outside the Association. However, I hope that

after this meeting we will be able to earnestly begin to do the real task.

What I am going to do now is to give a brief picture and a few major points on our application of the MTM procedure here in Skövde.

The Introduction of MTM

We introduced MTM here in Skövde almost 6 years ago, and there are just as many years of painstaking work behind the results which you have seen samples of during your tour through the plant. I suppose that some of you have said to yourselves: "It would be all right if I had my manufacturing arranged in the same way". I would like to tell you that there are no short-cuts to arrive at this goal. You cannot find a simple trick to get around the difficulties. The only way is for you yourselves to work out the problems. It takes education, a good staff, patience and adequate time to arrive at the results you have witnessed today.

We started our training in MTM about 6 years ago and we have been applying the procedure for about five years. During this time we have been able to install predetermined time standards on almost all the foundry operations. This foundry is an example of how the work flows in an activity, where the method development, wage incentive plans, and standard performance are based on MTM.

MTM in the Foundry

We have applied MTM to all our direct labor in the foundry. There are many different jobs in a foundry, such as molding, core making, pouring, cleaning, flask assembly, etc. As a matter of fact, we have found MTM useful for practically all the manual work in the foundry.

We have also been able, to some extent, to use MTM for the Foundry's service departments. This has been possible because MTM is a procedure based upon basic motion time standards which can be applied in many different ways.

It can be used in the strict formal sense by applying the methods-time data to each motion of an operation, however, it can also be used to develop standard data to arrive at a simplified method for piece rating jobs and this is accurate enough for incentives on most jobs.

We have used these approaches for repetitive maintenance jobs which are uniform in nature. We have even gone so far that the sweepers in the foundry are on incentive, based on time standards which were achieved with MTM. We have also established standards on the crushing of scrap and the lubrication of machinery with the help of MTM.

A few jobs still remain in the Foundry to be put on incentive such as wood and metal pattern making. We believe that the standards on these jobs can also be established since we already have solved similar problems with MTM. Some maintenance jobs are also without standards. There are of course some maintenance jobs which are practically impossible to rate, but there are also many of them which could be rated to a great advantage. In a few more years we believe that we will be able to establish standards on all jobs in the foundry with the help of MTM. The possibility of doing this, in line with our understanding, is greater than is generally believed.

If we can put our plans into effect, every man in our foundry will have consistent incentive standards. If we should take a cross section of Swedish industry today, it is no exaggeration to state that great deficiencies exist which could be eliminated with better methods of establishing standards.

When we introduced MTM in our foundry, we did not make any contract agreement with the workers. We agreed that we would try MTM so both parties could gain experience with this new tool. In this way MTM was used for several years and last fall we made a local contract agreement. This was made possible because in 1955 rules were introduced into the Collective Agreement between the Trade Union and the Swedish Metal Trade Employers Association which made it possible to establish local agreements concerning MTM. Our local agreement is a simple and brief statement which confirms that we agree on using the standard times of the MTM procedure. This statement also contains specifications of the wage factors which are to be applied to certain stated job evaluation groups. This agreement has been functioning since last fall. I believe both parties are satisfied that we now have an agreement which regulates the conditions for using MTM.

We believe that our foundry installation is an example of the results that can be achieved with the help of MTM. We think it is quite noticeable that behind practically every job there is a comprehensive method-study. We have a steady good working performance. Our working time is

used in a satisfying manner and we have actually never had any discussion about time standard basis. There are of course individual wage variations within our entire activities, but we are of the opinion that these are in proportion to skill and effort given by the operators. These variations are not due to inconsistent standards or method changes.

MTM in the Engine Manufacturing Plant

In the engine plant it has been more difficult to get started with MTM for various reasons. Because of the success we have had with our small passenger-cars and owing to the favorable position in our trade it was possible for us to build a new special department for these small passenger-car engines. We used MTM in all the production engineering and planning for this new engine department. Because of this reason it was only natural that we could also determine the amount of work for each individual work station and the same time introduce the MTM procedure to the activity.

While I am talking about this new engine department, I want to emphasize the value MTM has been in all planning and in the final installation of the plan by the methods departments. We have applied MTM throughout the planning phase. In this manner we have been able to develop an accurate time for the different alternative solutions. Because of this we have from the very beginning been able to select the method that under the circumstances was considered to be the best. All the planning connected with the plant layout, the detail scrutinizing of all methods, the arrangement of the work places and the design of tools have been put into effect in this way and it was possible to make them suit the established methods.

When we had completed the planning preparations, we also had a preliminary and complete MTM-analysis of each working operation. The day that all the equipment was delivered, all the machines were placed, all the work tools were on hand and the work places arranged, it was possible for us to take our analysis and read how, for the last half year or year, we had intended that the manufacturing lines were to function. There was no question about what method should be used and how it should be practically applied. At this point we organized a new method's group to scrutinize every work place regarding equipment and arrangements and to make final detail adjustments of the methods. This group then turned the specifications over to the supervisors. These specifications were complete with method descriptions and a stipulated work volume. In this way it has been possible to coordinate the planning phase and the carrying out of the production engineering work in a manner that previously was not possible.

MTM Generally

From what I have said about the value of MTM I do not want you to draw the conclusion that MTM is the only thing necessary to solve all the production technical problems in a satisfactory manner. I have only wanted to emphasize that MTM can become a valuable aid in production engineering. It is a means which can make it possible for the production technician to solve their problems in a much better way.

With heavy investments it is perhaps not so difficult to obtain good results. However, we have found that with the aid of MTM and comprehensive method analysis good results can be obtained with small investments. This is perhaps the most valuable part of the MTM procedure, and today it is especially valuable because it is difficult to obtain money, even for investments which cost-estimatings have proven as being ever so profitable.

APPLICATION I

MTM APPLIED TO A MOLDING OPERATION IN THE FOUNDRY

by

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In Cooperation With

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Although not completely installed, MTM has been successfully applied to some operation in each major department of our plant. In general, these include the foundry, core room and finishing departments.

In some cases MTM is actually being used for setting rates and standards and has also been applied on non-incentive items such as potential production determination and cost estimation. However, it is a simple matter to verify analyses in the latter situations and to apply them to incentive programs if it is so desired.

The foundry operations referred to are green sand molding and shell making. Photos are included which show some of the more important steps in each of the operations. The green sand cope and drag operation will be explained. A jolt-squeeze machine is used in the process with one cope and one drag station and an operator for each. Photo No. 4 presents a general layout of the set-up. The drag machine is at the left along with the cope machine at the right. It also shows the slip-type flasks that are used for making the mold. The drag operator works with two drag flasks and the cope operator with one cope flask. The core supply system may be seen in both photos No. 2 and No. 4. It is simply a roller conveyor fed by a service man. The cores are set on regular transite plates.

Of course, it was necessary to complete MTM analyses of both stations.

The drag operation is started after the operator sets his cores or after placing the mold on the conveyor line. Getting the drag flask is covered in element D-I. Photo No. 4 shows the bench on which the extra flask sets.

In D-II the flask is positioned on the pattern. Photo No. 4 also shows this. The 40.5 lbs. noted in the move convention is weight of the empty flask and must be handled with both hands. The TMU value is of course computed by MTM standard procedure. The full value is allowed even though the flask is held against the body for better and easier handling. There are two pins on a drag flask, but only one positioning is shown in this element. One pin is hexagonal shaped and the other is a round pin. Tolerances on the pins are close. The hex pin is positioned first so by definition the case of symmetry would seem to be semi-symmetrical. However, due to the taper of the pin a class I fit exists. The case of handling was classified as "difficult" due to the bulkiness of the flask. Thus a "P1SD" was used based on the fact that with a reasonable amount of practice all cases, except handling, could be reduced to a minimum. With a highly skilled operator it's possible that this convention might be reduced to Move.

In D-III, the operator sprays the pattern with a parting liquid. The convention used for the actual spraying operation is an M1A. This is accomplished with three swift motions of the nozzle and only wrist action is involved. It was a little difficult to determine whether a type II motion existed or not. Ordinarily these might have been "B" Moves with a hand in motion so a case "A" was assigned to the convention instead.

Element D-IV shows the motion pattern for filling the flask with sand. Photo No. 3 also shows this action. The Reach to the hopper is of greater distance than actually shown. It is overlapped by the pace time, leaving only 16 inches that is chargeable. The actual filling of the mold is mechanical in nature and is stopwatch time.

Element D-V shows the pattern involved for jolting the sand and flask. While the flask is jolting the operator Reaches to the flask and distributes the sand as evenly as possible.

In D-VI and D-VII the bottom board is placed on the mold in preparation for the squeeze.

In element D-VIII the squeeze head is moved over the mold and the squeeze completed. The head is set in motion then is released and allowed to swing the remainder of the distance by virtue of its own inertia. Finally it is guided into position the last couple of inches to keep it from bouncing away from its stop. From the time the squeeze lever is released the process is timed by stop watch since the action is mechanical.

In element D-IX the mold is lifted from the pattern. The squeeze head is returned to its original position and at the same time the lifter lever is actuated to strip the mold from the pattern. The stripping process is mechanical and again the stop watch used.

In element D-X the lifter legs are lowered and at the same time the mold is carried (against the body) to the mold conveyor. The motion involved in placing the mold on the line is nearly a Body Bend (B) but is overlapped by the two paces. The drag must be rolled over so the pins are in an "up" position to receive the cope. The drag is lifted with the pins down and edge is set on the conveyor car and rolled over to its characteristic position on the line. Following this he moves to the other drag flask on the bench which can be seen in photo No. 1.

Before proceeding to explain the cope molding analysis something ought to be mentioned about allowances and weight calculations.

In this plant there is an allowance to be considered when a mold weighs over 50 lbs. This is done whether it is handled with one or two hands. However, all molds must be handled with two hands. The allowance has been classified as an additional fatigue allowance in addition to the standard MTM allowance of 5%. This figure is not directly added to the "element time" but to the "total time allowed"; otherwise one allowance would be multiplied by the standard allowance. Since some definite time allowance had to be established, a relatively long term study was made of cycle times to determine whether or not cycle times increased through the shift and how much. After leveling performance and an evaluation by management it was agreed that an additional fatigue allowance was in order. The time allowance was set at 0.004 min./lb. or about 6.67 TMU/lb. This then was an additional fatigue allowance for every lb. of weight over 50 lbs. So, a 115 lb. (D-X) mold would carry an additional allowance calculated in the following manner:

$$(115\# - 50\#)\frac{(.004 \text{ min.})}{.006 \text{ min/TMU}} = 433.6 \text{TMU or}$$

$$0.260 \text{ mins.},$$

whichever unit is preferred. This in turn would be added to the "total allowed time". It's common knowledge of course that the MTM Data card does not allow for weights over 47.5#. Nevertheless we have molds that are handled manually and weigh at most 115 lbs. so an allowance is made in the above prescribed manner.

The cope operator places his cope on the mold and removes both the cope and drag flasks from the mold and places them on the drag bench.

In element C-I the cope operator removes his flask from the drag and places it on the pattern. The pins in this case are located on the machine. They are both tapered and again one being of hexagonal section and the other circular. Here also the operator merely positions the left hex pin and the other automatically lines up. Then the weight of the flask permits it to drop in place.

The next three elements are the same as for the drag operation. Photo No. 3 is incorporated in elements C-III and D-IV on the analyses for the cope and drag respectively.

The cope requires no bottom board for placement on the drag. However a squeeze board is fastened on the squeeze head of the machine.

Element C-V shows the motion pattern for bringing the squeeze head into position and squeezing the mold. It is very similar to the drag motion pattern. The operator accomplishes a couple of things after the squeeze lever is released. He reaches to the squeeze head with his right hand and moves his left hand to the corner of the flask and wipes the sand from the flask bushings. They are limited out by the machine time since they are done while the cope is moving away from the squeeze head. Again the machine time was determined by stop watch.

In this element (C-VI) the squeeze head is moved aside with a "B" Move and coasts out of the way against a stop. Due to the inertia forces generated it was decided that a type II motion should not be allowed. Then the operator reaches for the lifter lever and depresses it.

Element C-VII notes two things happening at once. While the lifter legs raise the cope from the pattern the operator wipes the sand from the

edge of the mold with "B" Moves. The lifted cope is shown in photo No. 2. The air hose is reached for and secured with the right hand and moved to the sprue hole while the left hand cleans the sand from the bushing. The air hose button is actuated with a "B" fractional Move and held until the operator is satisfied that the sprue hole is clean. This time was again determined with a stop watch, using the average. The right hand employs a normal release and reaches to the other bushing and cleans it off. As noted in the element, all the manual time was allowed in fairness to the operator going along with the assumption that the mechanical time is limited out.

In element C-VIII the mold is taken to the conveyor and placed on the drag. Both hands reach to the flask handles and they are in fixed locations each time. The simple grasp is used and just prior to lifting, the operator gets a better grip on the flask. He moves the cope, supporting it with his body, to the conveyor with a Turn Body, case no. 1. The paces are valued at 17.0 TMU due to the amount of weight involved which has a tendency to retard his normal movement. Again the operator aligns the cope to the closing pins. One position is all that is necessary since the other automatically aligns itself and again it should be pointed out that skilled operators are performing this motion pattern. Since the cope sets on the drag, the hands follow it with an "A" Move and then releases it.

During this element (C-IX) the cope operator removes both the cope and drag flasks from the conveyor. The locks on the cope are unlocked with "A" Moves and the same applies to the drag - case "A" because these are controlled paths of motion. The operator removes the whole unit by a case "A" Reach to the drag handles and employs a single grasp. The complete flask is moved to the drag bench and released as noted on the analysis sheet.

All additional and following elements are considered variables in the sequence of the above analyses of this particular molding operation.

In the C-X element the cope operator moves toward the conveyor line with the motion pattern noted.

In C-XI the operator cleans out the drag mold with pretty much the same pattern used for blowing off his cope mold. This is done prior to setting his cores. In element C-VII the motion used to actuate the air nozzle was an MfB. The nozzle has a plier-type handle and a very short move is required. In this case the nozzle is the button type and is depressed to its maximum travel. The travel is very small thus qualifying it as an MfA Move. An AP1 might be considered here but watching the operation and the swiftness with which the operator accomplishes this action, it didn't seem necessary to allow more than a fractional "A" Move. The Apply Pressure had no retarding effect on the operators motions.

The drag or cope operator may set two "B" cores which, in general can be classed as a "barrel" or cylindrical type core. This is noted in study No. 1, sheet No. 1 of 1 sheet for cope and drag molding. The motion pattern is self explanatory but a point or two might be discussed. After getting the cores and securing the grip, they are placed in the mold but not simultaneously. It will be noted that after the positioning is complete two MfC Moves have been allowed. One of the short Moves is used for placing the core beyond the one inch of travel allowed in a Position and the other for a slight twisting action to break any corners in the core seat to prevent the formation of fins on the castings. A case "C" Move is applied because a good deal of care must be exercised in this motion.

In addition the cope or drag operator may set two "B" cores and one skim core. Photo No. 2 shows these already set in the drag mold. The drag operator sets two of these. This is noted on analysis study No. 2, sheet No. 1 of 1 sheet. The motion patterns here are the same, practically, as for the "B" cores. Further comment can be made in regard to the setting of the skim core. This core is approximately 1/2" thick and about 2" in diameter. It is placed with a "C" Move and a simple position followed by a fractional "A" Move. One side or portion of the core is positioned first, then the whole core is moved down against the sand and an MfA was allowed for this extra motion with a normal release following.

Another type of variable exists when an operator sets a skim core and two slag cores. The slag cores are used to prevent the impurities and slag from entering the casting cavity with the molten iron. This operation is noted on study No. 3, sheet No. 1 of 1 sheet. The operator Reaches with a "B" case to the tote pan. It was decided that the core is of sufficient size to warrant nothing more than this type of Reach. However, they were jumbled enough to apply the G4A grasp for control. There has been consid-

erable discussion on this point in our department and on more recent analyses this has been reduced to a G1A. This seems justifiable when the operation is actually observed. Then the skim core is moved to the general area of the mold with a "B" Move and a "C" Move prior to positioning. The core seats itself partially but must be completely and finally set by the operator. To do this he releases the core and Reaches back to it with a fractional "B" Reach and an AP2. After that he reaches to his right hand to get a slag core and transfers it with a G3. Then the slag core in the right hand is positioned with a P1SSE since it can be placed in only one of two ways. One end is placed first which automatically aligns the other. Two fractional "C" Moves are used to accomplish this since a certain amount of care is required. The same pattern follows for the core in the left hand.

In conclusion of the listing of the variables for this particular operation our study for peening a mold might be worthwhile mentioning. Peening consists mainly of packing the sand around the edges of a mold with a wedge-shaped but blunt wooden hammer. They are also made of metal. The mallet is located on a bench along side the operator. The photo on mount No. 2 shows the handle protruding from its position on the bench. Peening may be needed in all of the molding operations on this line. A "B" Reach is used along with the simple grasp to gain control of the mallet. As it is moved to the mold the left hand reaches over to get hold of the mallet. The move up is classified as a "B" Move and downward stroke as an "A" Move against the sand. A lower case "w" is recorded with the convention merely to note that weight is involved especially if the actual weight is more than 2.5 lbs. In this case the ENW would not have to be considered since it is less than 2.5 lbs. and the peening is done with both hands. Any series or number of peens may be needed depending on mold hardness requirements - so a chart was prepared. It is only necessary to determine the number of peens required so the total allowed time in minutes can be read directly from the chart. A complete cycle with one peen would have the following motion pattern:

L. H.	TMU	R. H.	
	12.9	R12B	To handle
	2.0	G1A	Get
(R8A)	13.4	M12Bw	Over mold
		T90S	Mallet
G1A	2.0		
M4Bw	6.9	M4Bw	Move up
M3Aw	4.9	M3Aw	Move down
(RL1)	13.4	M12Bw	To bench
	2.0	RL1	
Total	57.5 TMU		

This particular analysis happens to satisfy an 8-peen motion pattern.

As previously stated, MTM has been used in every major department of operations except heat treat. However, we plan on doing so for a hot shear operation which consists of shearing the gate from a casting as soon as it leaves the hearth of a draw furnace. It is our intention to broaden the installation of MTM until all or most of our incentive plans are based on the system.

APPLICATION I

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 4-26-56 STUDY NO.

OPERATION Make Cope Mold ANALYST L. Bachinski SHEET NO. 1 OF 4 SHEETS

Description — Left Hand	No.	LH TMU	RH No.	Description — Right Hand

Starting Conditions

Operator has just set both cope and drag flasks on storage bench.

C-I Remove Cope Flask from Drag Flask & Place on Pattern

Reach to lock	R4A	6.1	R4A	Reach to lock
	G5	0.0	G5	
To locks	AP2	10.6	AP2	To locks
	RL2	0.0	RL2	
Reach to handle	R4A	6.1	R4A	Reach to handle
Handle	G1A	2.0	G1A	Handle
Move Flask up	M6B $\frac{36}{2}$	18.3	M6B $\frac{36}{2}$	Move flask up
Toward machine	TBC1	18.6		
To machine	WIP	15.0		
Bushings to pin	PISD	11.2		
	RL1	2.0	RL1	Handles
Total Time		89.9 T.M.U./mold		

C-II Spray Pattern with Parting

Same as D-III

Total Time 48.4 T.M.U./occurrence

C-III Fill Flask with Sand

Same as D-IV

Total Time 105.1 T.M.U./mold

C-IV Start Jolt & Level Sand

Same as D-V

Total Time 99.9 T.M.U./mold

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 4-26-56 STUDY NO.

OPERATION Make Cope Mold ANALYST L. Bachinski SHEET NO. 2 OF 4 SHEETS

Description — Left Hand	No.	L H	TMU	R H	No.	Description — Right Hand
C-V Get Squeeze Head, Move Over Mold, & Squeeze						
			21.5	R24B		Hand to squeeze head
			2.0	GIA		Head
To head	(R12B)		20.2	M18B5		Swing head
Head	GIA		2.0	RL1		Head
Head to exact position	(M2A)		9.6	R12A		Hand to squeeze lever
			0.0	G5		Squeeze Lever
			2.9	M1B2		Lever down part way
Head	(RL1)		10.6	AP2		To lever
			0.0	RL2		Lever
Wait for mold to descend	SW		35.0	(R24B)		Hand to squeeze head
(Avg. of machines)			0.0	G5		Squeeze head
To corner of flask	~~R8B~~		~~11.5~~			
Wipes sand from flask edge	~~M18B~~		~~17.0~~			
Total Time			103.8 T.M.U./mold			
C-VI Aside Squeeze Head - Lift Mold						
			11.6	M6B5		Start head away
			0.0	RL2		
			14.9	R24A		Hand to lifter lever
			0.0	G5		
			4.9	M3A		Lifter lever
Total Time			31.4 T.M.U./mold			

APPLICATION I

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 4-26-56 STUDY NO.

OPERATION Make Cope Mold ANALYST J. Zachinski SHEET NO. 3 OF 4 SHEETS

Description — Left Hand	No.	L H	TMU	R H	No.	Description — Right Hand
C-VII Clean Cope & Blow Out Sprue Cup:						
(Note - Lifter legs rising during operation - 35 T.M.U.)						
Hand to top of flask		(R5B)	17.2	R18B		Hand to top of flask
Hand to front, wiping sand		M16B	15.8	M16B		Hand to front, wiping sand
			15.8	M16B		Hand along back of flask, wiping off sand
To left bushing		R8B	10.1	R8B		To air hose
			2.0	G1A		Hose
Clean sand from bushing	2	(M2A)	12.2	M10B		Hose to sprue hold
			2.0	MFB		Depress button
			5.0	SW		Hold button
			2.0	RL		Hose
			12.9	R12B		to right bushing
			9.2	M2B	2	Clean sand from bushing
Total Time			104.2 T.M.U./mold			
C-VIII Close Mold						
Hand to handle		R6A	7.0	R6A		Hand to handle
Handle		G1A	2.0	G1A		Handle
Set hands		G2	5.6	G2		Set hands
		M4B $\frac{94}{2}$	26.4	M4B $\frac{94}{2}$		Against body
			18.6	TBC1		
		W2PW	34.0	W2PW		To conveyor
			11.2	PISD		Bushings to pins
			11.0	M5A $\frac{94}{2}$		(Less constant)
Handles		R1.1	2.0	R1.1		Handles
Total Time			117.8 T.M.U./mold			

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 4-26-56 STUDY NO.

OPERATION Make Cope Mold ANALYST L.Bachinski SHEET NO. 4 OF 4 SHEETS

Description — Left Hand	No.	L H	TMU	R H	No.	Description — Right Hand
C-IX Remove C & D Flasks from Mold & Place on Storage Bench						
To cope lock		R4A	6.1	R4A		To cope lock
Lock		G5	0.0	G5		Lock
Move lock up		M3A2	4.9	M3A2		Move lock up
		RL2	0.0	RL2		
To drag lock		R4A	6.1	R4A		To drag lock
Lock		G5	0.0	G5		Lock
Move lock down		M3A2	4.9	M3A2		Move lock down
		RL2	0.0	RL2		
To drag flask handle		R4A	6.1	R4A		To drag flask handle
Handle		G1A	2.0	G1A		Handle
Move MT flask up		M10B $\frac{72}{2}$	29.5	M10B $\frac{72}{2}$		
			18.6	TBC1		
To bench		W2PW	34.0	W2PW		To bench
Handle		RL1	2.0	RL1		Handle
Total Time			114.2	T.M.U/mold		
C-X Move to Conveyor from Machine or to Machine from Conveyor						
(Necessary only if cope man sets cores)						
			18.6	TBC1		To Rt or Lt
			15.0	WIP		
Extend for next element		~~R B~~	-	~~R B~~		Extend for next element
Total Time			33.6	T.M.U./occurrence		
C-XI Blow Off Mold - Drag - Prior to Setting Cores						
(May be Rt or Lt Hand)						
To hose		R30B	25.8			
		G1A	2.0			
		M10B	12.2			
Depress button		MfA	2.0			
	2	M5B	16.0			
		RL1	2.0			
Total Time			60.0	T.M.U./mold		

Form 191-BPC-12-56

APPLICATION I

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 4/18/56 STUDY NO. 1

OPERATION Make Drag Mold ANALYST L. Bachinski SHEET NO. 1 OF 4 SHEETS

Description — Left Hand	No.	LH	TMU	RH	No.	Description — Right Hand

Starting Conditions

Operator has just finished setting cores in last mold made, or has just set cope on line if no cores.

D-I Get Drag Flask on Bench

Move to storage bench	TBC2	37.2			
	WIP	15.0			
Hand to handle	~~R8B~~	~~10.1~~	~~R8B~~		Hand to handle
	GIA	2.0	GIA		
Total Time		54.2	T.M.U./mold		

D-II Invert Flask & Place on Pattern

Move near side of flask up, sliding to end of bench (Either 4 3/4 or 6 1/4")	~~M12B $\frac{40.5}{2}$~~	23.7	M12B $\frac{40.5}{2}$	Flask resting against body (Note total weight allowed)
	~~TBC1~~	~~18.6~~		
Handle	RL1	2.0	RL1	Handle
To new location	R2B	4.0	R2B	To new location
Handle	G1A	2.0	G1A	Handle
	SS15C1	18.8		
Flask (Pins to bushings)	M6C $\frac{40.5}{2}$	20.0	M6C $\frac{40.5}{2}$	Not OL by SS
Pin to bushing	P1SD	11.2		
Flask down	M3A	4.9	M3A	
Handle	RL1	2.0	RL1	Handle
To locks	R10A	8.7	R10A	To locks
To locks	AP2	10.6	AP2	To locks
	RL2	0.0	RL2	
Total Time		107.9	T.M.U./mold	

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 4/18/56 STUDY NO. 1

OPERATION Make Drag Mold ANALYST L. Bachinski SHEET NO. 2 OF 4 SHEETS

Description — Left Hand	No.	LH	TMU	RH	No.	Description — Right Hand
D-III Spray Pattern with Parting						
			21.5	R24B		To hose nozzle
			2.0	G1A		Hose nozzle
			13.4	M12B		Hose to position over pattern
			2.0	MfA		Depress handle
			7.5	MIA	3	Move hand to spray
			2.0	RL		Hose
Total Time			48.4	T.M.U./occurrence		
D-IV Fill Flask with Sand						
			15.0	WIP		Step back
			15.8	R16B		Hand to sand hopper handle (Non-OL time only)
			2.0	G1A		Sand hopper handle
			20.3	M8B20		Handle down
			50.0	S.W.		Hold for sand to fill flask
			2.0	RL1		Handle
Total Time			105.1	T.M.U./mold		
D-V Start Jolt & Level Sand						
(can be RT or LT)			7.9	R8A		To jolt start button
			2.0	MfA		Depress button
			90.0	SW		Jolt Standard 10 times
To sand on flask	~~R24A~~		14.9	~~R24A~~		To sand on flask
						Levels sand as required until jolt times out
Total Time			99.9	T.M.U./mold		

APPLICATION I

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 4/18/56 STUDY NO. 1

OPERATION Make Drag Mold ANALYST L.Bachinski SHEET NO. 3 OF 4 SHEETS

Description — Left Hand	No.	LH	TMU	RH	No.	Description — Right Hand
D-VI Get Bottom Board from Conveyor						
			18.6	TBC1		Toward conveyor
To sides of board		R12B	12.9	R12B		(Non-overlapped only)
Side of board		G1A	2.0	G1A		Side of board
	2	M10B $\frac{6.5}{2}$	30.2	M10B $\frac{6.5}{2}$	2	Board down on
Total Time			63.7	T.M.U./mold		
D-VII Place Bottom Board on Mold						
		TBC1	18.6			Toward mold
Board on mold		M8B $\frac{6.5}{2}$	13.4	M8B $\frac{6.5}{2}$		Board on mold
Board		RL1	2.0	RL1		Board
Total Time			34.0	T.M.U./mold		
D-VIII Get Squeeze Head, Move Over Mold & Squeeze						
Hand to squeeze head		R24B	21.5			
Head		G1A	2.0			
Swing head		M20B5	21.5			
(Let head coast)		RL1	2.0			
To new point on head		(R6B)	11.4	R16A		To squeeze lever
Head		G1A	2.0	(G5)		
To exact position over mold		M2A5	6.0			
			7.1	M2B5		Squeeze lever down
(Hand rests on head)			10.6	AP2		To squeeze lever
			0.0	RL2		
(Average of machines)			35.0	SW		Wait for mold to descend
			~~8.7~~	~~R10A~~		Hand to lifter lever
Total Time			119.1	T.M.U./mold		

Form 191-RPC-13-56

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE [illegible] STUDY NO.

OPERATION Make Drag Mold ANALYST L.Bachinski SHEET NO. 4 OF 4 SHEETS

Description — Left Hand	No.	L H	TMU	R H	No.	Description — Right Hand
D-IX Aside Squeeze Head - Lift Mold						
Start head		M8B5	13.4			
		(RL2)	4.9	M3A		Lifter lever to LT
			0.0	RL2		
Average time			25.0	SW		Lifter legs raise
Hand to flask handle		~~R10B~~	~~21.5~~	~~R24B~~		Hand to flask handle
Total Time			43.3	T.M.U./mold		
D-X Place Mold on Conveyor						
Flask handle		G1A	2.0	G1A		Flask handle
Set hands		G2	5.6	G2		Set hands
			~~7.1~~	~~LM~~		Lifter lever to RT with knee
		$M4B\frac{115}{2}$	26.4	$M4B\frac{115}{2}$		Against body
			18.6	TBC1		To conveyor
		W2PO	34.0	W2PO		Obstructed against conveyor
			~~29.0~~	B		Bend Body downward
Handle		G2	5.6	G2		Handle
(Part of Wt. on conveyor)		$M10A\frac{75}{2}$	30.6	$M10A\frac{75}{2}$		Lower to conveyor
		RL1	2.0	RL1		
Total Time			153.8	T.M.U./mold		

METHODS ANALYSIS CHART

REFERENCE NO.

PART Unit #3 Squeezer Molding DATE 10-12-56 STUDY NO. 23

OPERATION Peen Mold with Mallet ANALYST L. Bachinski SHEET NO. 1 OF 1 SHEETS

Description — Left Hand	No.	LH TMU	RH No.	Description — Right Hand
Starting Conditions: Operator has just completed filling cope or drag flask with sand and completed jolting mold. Peen mallet is located in lower shelf of core bench to right or left of the operator.				
Get mallet and move over mold:		12.9	R12B	Reach to handle
		2.0	G1A	Get
Reach to mallet	R8A	13.4	M12Bw	Move over mold
		-	~~T90S~~	Turn mallet 90° vertical (O.L.)
	G1A	2.0		
	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 1st
	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 2nd
	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 3rd
Same as other hand	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 4th
	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 5th
	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 6th
	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 7th
	M4Bw	6.9	M4Bw	Move up
	M3Aw	4.9	M3Aw	Move down 8th
Release	RL1	13.4	M12Bw	Mallet to bench
		2.0	RL1	Release
Total time		140.1	T.M.U.	

Form 191-ACP-5-56

10-12-56

Unit #3 Squeezer Molding

Peen Mold with Mallet

Number of Peens	T.M.U.'s	St'd. Minutes	Allowed Time
1	57.5	.03450	.05348
2	69.3	.04158	.06445
3	81.1	.04866	.07542
4	92.9	.05574	.08640
5	104.7	.06282	.09737
6	116.5	.06990	.10835
7	128.3	.07698	.11932
8	140.1	.08406	.13029
9	151.9	.09114	.14127
10	163.7	.09822	.15224
11	175.5	.10530	.16322
12	187.3	.11238	.17419
13	199.1	.11946	.18516
14	210.9	.12654	.19614
15	222.7	.13362	.20711
16	234.5	.14070	.21809
17	246.3	.14778	.22906
18	258.1	.15486	.24003
19	269.9	.16194	.25101
20	281.7	.16902	.26198
21	293.5	.17610	.27296
22	305.3	.18318	.28393
23	317.1	.19026	.29490
24	328.9	.19734	.30588
25	340.7	.20442	.31685

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 3-11-57 STUDY NO. 1

OPERATION Set Two "B" Cores (Drag) ANALYST L. Bachinski SHEET NO. 1 OF 1 SHEETS

Invert & set two "B" Cores - Drag Operator

For Use Where Drag Operator Sets Two "B" Cores

Description — Left Hand	No.	LH	TMU	RH	No.	Description — Right Hand
To core		R24B	21.5	R24B		To core
Core		G1A	2.0	G1A		Core
Core Toward Mold		M20B	18.2	M20B		Core Toward Mold
Core		~~G2~~	-	~~G2~~		Core
	2	G2	11.2	G2	2	Invert Core
			8.0	M4C		to cavity
			5.6	PlSe		Align
			4.0	MfC	2	Down
			10.6	AP2		Seat Core
To cavity		M4C	8.0	(RL1)		
Align		PlSe	5.6			
Down	2	MfC	4.0			
Seat Core		AP2	10.6			
Core		RL1	2.0			
Total Time			111.3	T.M.U/Mold		

111.3 x .0006 = .06678 minutes

.06678 x 155 = .10351 allowed minutes

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 Cope & Drag DATE 3-4-57 STUDY NO. 2

OPERATION Set Two "B" Cores ANALYST L. Bachinski SHEET NO. 1 OF 1 SHEETS

Description — Left Hand	No.	LH	TMU	RH	No.	Description — Right Hand
Invert & set two "B" cores						
						For Use Where Cope OR Drag Operator Sets Two "B" Cores & One Skim
To Cores		R12B	12.9	R12B		To skim
Two cores		G1A	2.0	G1A		Skim
To Rt. Hand		M20A	19.2			
			5.6	G3		One Core
Invert Core	2	G2	11.2	G2	2	Invert Core
			15.2	M12C		To Cavity
			5.6	PlSE		Align
			4.0	MfC	2	Down
			10.6	AP2		Seat Core
			-	~~RL1~~		Core
		M12C	15.2	M6C		Skim to print
		PlSE	5.6	PlSE		Align
	2	MfC	4.0	MfA		Down
		AP2	10.6	RL1		Skim
		RL1	2.0			
Total Time			123.7 T.M.U./mold			

123.7 T.M.U. x .0006 = .07422 minutes
.07422 x 155 = .11504 allowed minutes

APPLICATION I

METHODS ANALYSIS CHART

REFERENCE NO.

PART Line #3 (5) DATE 4/27/56 STUDY NO. 3

OPERATION Set Cores - Drag Operator ANALYST L.Bachinski SHEET NO. 1 OF 1 SHEETS

Description — Left Hand	No.	L H	TMU	R H	No.	Description — Right Hand
D-XII Set Skim Core & Two Slag Cores						
To skim core		R24B	21.5	R24B		To slag cores
Core		G4A	7.3			
			7.3	G4A		Two cores
Toward cavity		M20B	18.2	M20B		
		~~G2~~	~~5.6~~			
To cavity		M6C	10.3			
Core		P1SE	5.6			
Down		MfA	2.0			
Core		RL1	2.0			
To Core		RfB	2.0			
Seat Core		AP2	10.6			
To core		R7A	7.4	(M5A)		
Core		G3	5.6			
Core		G2	5.6	G2		Core
			15.2	M12C		To cavity
			9.1	P1SSE		
			4.0	MfC	2	Down
To Cavity		M12C	15.2	(RL1)		
		P1SSE	9.1			
Down	2	MfC	4.0			
		RL1	2.0			
Total Time			164.0	T.M.U.'s/mold		

164.0 T.M.U.'s x .0006 = .09840 minutes

.09840 x 155 = .15252 allowed minutes

3-4-1957

Line #3 Cope & Drag Molding

Constant Time Summary

Cope Constant =	.46266 standard minutes
Drag Constant =	.47148 standard minutes
Total Cope & Drag	.93414 minutes
.93414 ÷ 2 =	.46707 standard minutes
.46707 x 155 =	.72396 allowed minutes

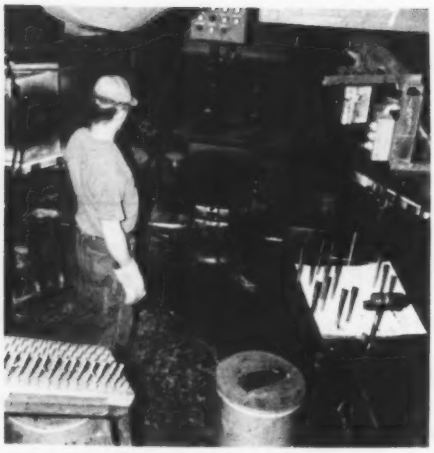
Use the average of the two constants when calculating rates. Since the rate is set on the operator with the greater allowed time (cope or drag) these two items shall be averaged. Therefore, with the constants the same, the other items will determine which operator has the greater amount of allowed time.

The other items may be balanced to make the allowed time of the operators total as close as possible. This is necessary to keep one operator from waiting for the other and keep production up with minimum of allowed time in the rate.

L. Bachinski

Industrial Engineer

LBachinski:h

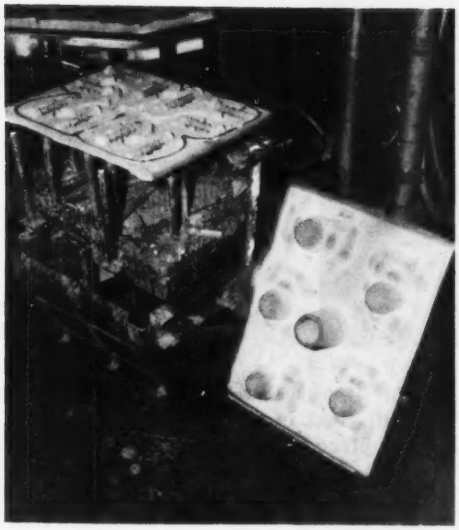


Typical lay-out of Chicopee Twin Shell Making External, showing cores on rack at lower left; stripper station upper center, and bonding fixture at right of picture.

Operator is removing shell mold from stripper station. This operation must be executed with speed and accuracy because of the short time that the shell is raised on the lifter pins. Shells can break easily if not removed carefully.

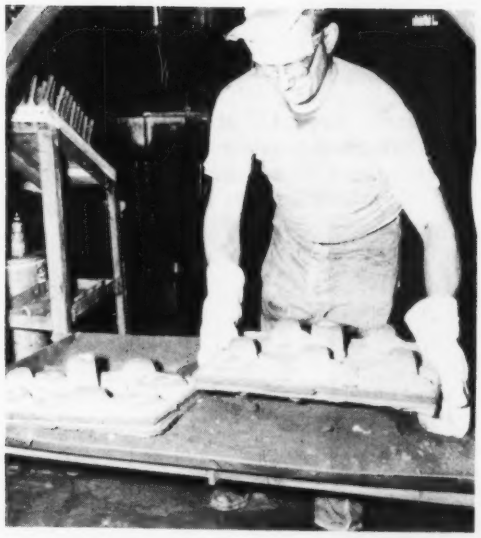
After removing shell from stripper station operator breaks shell in two pieces. (Cope and Drag). This is done by hitting the shell in the middle with the knee.

After shell has been broken into Cope and Drag, the Drag 1/2 is placed on the bonding fixture, and the Cope 1/2 is placed on the rack to the right of the fixture. Cores, which are used in the particular job are located on rack, shown here, to rear of the operator. Also shown in photo 1.

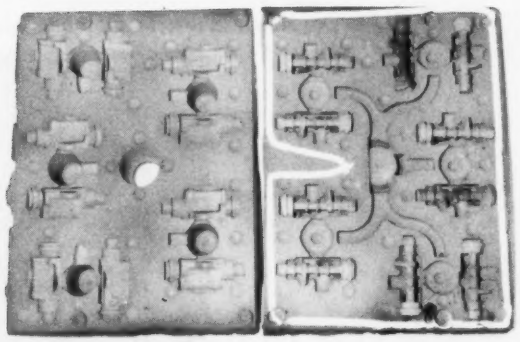


Here we see the cores (10) in place in the Drag 1/2 of the shell and the glue; used for bonding, applied and ready for closing.

Operator puts Cope 1/2 of shell on the Drag 1/2 shell, which has the cores and bonding glue applied, ready for bonding.



After shell has been bonded it is removed to the travelling molding conveyor, by the operator; ready for pouring of the iron.

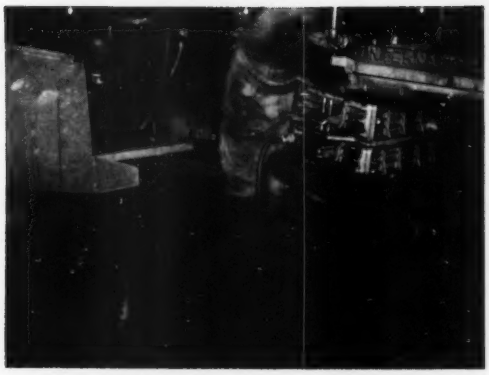


Here we see a "Valve Body Casting" shell, with the Cope 1/2 at left; and the Drag 1/2 at right with cores in position, and a typical glue line, represented in chalk.

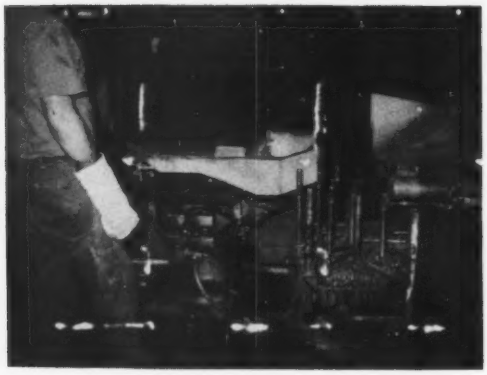
General set-up of Cope & Drag Stripper Station, Line #3. Picture shows Drag station (with flask in position) at left and Cope station (with flask in position) at right. Extra Drag flask used in operational rotation is in place on bench at front.

Drag 1/2 of mold moving on conveyor with cores in place. Cope 1/2 of mold is raised on lifter pins ready for clamping to Drag 1/2 mold.

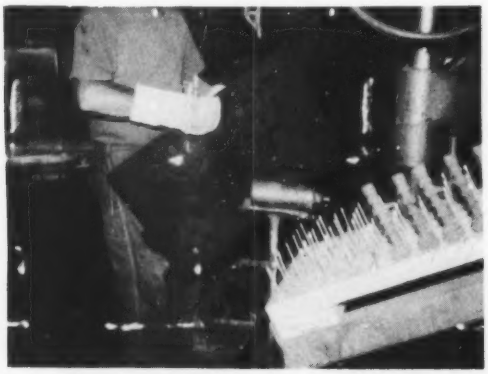
Cope operator is shown filling mold with sand from storage hopper directly above machine. Note: Drag 1/2 flask on table is idle, yet Drag operator (not shown) is filling flask at the same time as the Cope operator with 2nd of 2 Drag flask.



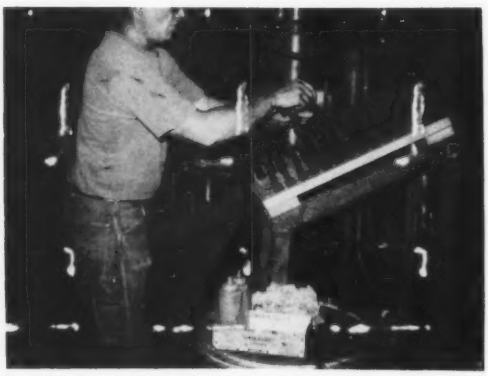
Picture shows lay-out of Line #3 Plate molding. Cope and Drag flask along with the pattern plate are in position on machine. Peening mallet used on this particular job is also in position on lip of work bench to operator's right.



Line #1 Shell molding pattern has just been removed from rt. oven and is stopped at stripper station in front of operator ready for removal. Bonding fixture with glue container is shown at rt.

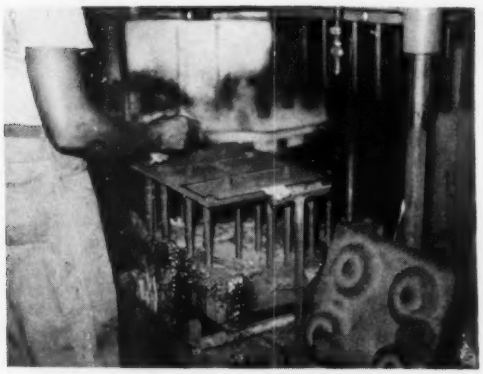


Operator has just removed shell mold from stripper station and is moving to bonding fixture for gluing operation.



Operator is getting cores from intricate rack to rt. of bonding fixture preparatory to setting in the Drag 1/2 of shell.

Shows operator applying glue to Drag 1/2 shell after cores are set. Cope 1/2 of shell is on stand to rt. and below core rack.



Close-up of Drag 1/2 of shell on bonding fixture shows route of glue line around casting cavities.

Operator is removing small fin left on Carrier core prior to placing core in drier shown at lower rt. of picture.

Shows core in core box after being removed from flow machine at rear prior to placing in core drier at front on bench.

Shows two identical core boxes used in rotational operation. Box at lt. is in position ready for blowing while box at rt. will be put into blow position upon removal of other box.

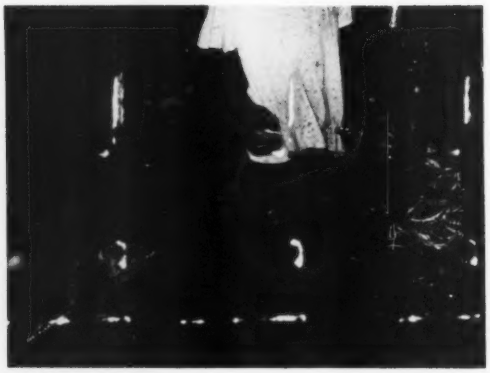
Operator is placing core, in drier, on rack which rotates slowly through core oven. Oven is directly to rear of blow machine

Part of lay-out of blow machine, and oven, with core, and box, and drier in place on bench.

Typical shearing operation of hub casting in place in storage bins to left of operator and machine.

Casting in place in shear with knife blade coming down to shear gate off casting.

Lay-out of shearing operation with castings in bin to left of operator, machine in front and dispose slide to right leading to storage bin below.



Showing casting in motion going down slide to bin, after dispose by operator. Disposal also shown in photo No. 3.

APPLICATION II

CHICAGO CONTAINER STANDARD BUNDLING DATA

by

Franklin H. Cloud
American Box Board Company
Chicago, Illinois

The final unit of time shown in the following article are so called true work minutes, which exclude any relaxation factors and are levelled to a day work pace of 75%.

Chicago Container — TAPER OFFBEARING — 6/12/57

BUNDLING

Product: Various size stacks of taped boxes. Open blank size of boxes up to 32 sq. ft.

Operation: Set the Jogged and Aligned stack down.
Section #1 - Cross Tying - Throw first loop around stack, cross twines and make second loop, tie standard bundlers knot.
Section #2 - Tie 2 Twines One Way - Throw first loop around stack, tie standard bundlers knot, throw second loop around stack, tie standard bundlers knot.
Section #3 - Corner Tying - Hook loop of twine between ppposite stack corners, tie standard bundlers knot.
Aside tied bundle to pallet and return.
Obtain and position empty pallet, shove completed load down floor conveyor.

Equipment: Automatic (ZB) or Semi-Automatic (Universal) taping machines. 10' of elevated (32") 18" wide bundling conveyor. Two strips of 18" wide floor conveyor spaced one foot apart. 44" X 60" wooden pallets.

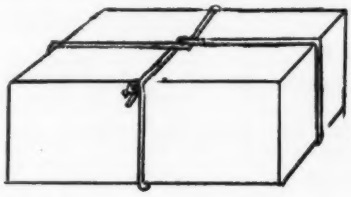
Basis of Date: MTM analysis of true work time per bundle.

OPEN BLANK AREA IN SQ. FT.	TRUE WORK TIME/STACK CROSS TIE	2 TWINER	CORNER TIE
Up to 3.999	.129	.211	
4.000 - 5.999	.134	.216	
6.000 - 7.999	.138	.219	
8.000 - 9.999	.141	.222	
10.000 - 11.999	.144	.225	
12.000 - 13.999	.146	.229	
14.000 - 15.999	.148	.232	
16.000 - 17.999	.150	.235	
18.000 - 19.999	.151	.238	.138
20.000 - 21.999		.241	.139
22.000 - 23.999			.140
24.000 - 25.999			.140
26.000 - 27.999			.141
28.000 - 29.999			.142
30.000 - 31.999			.143

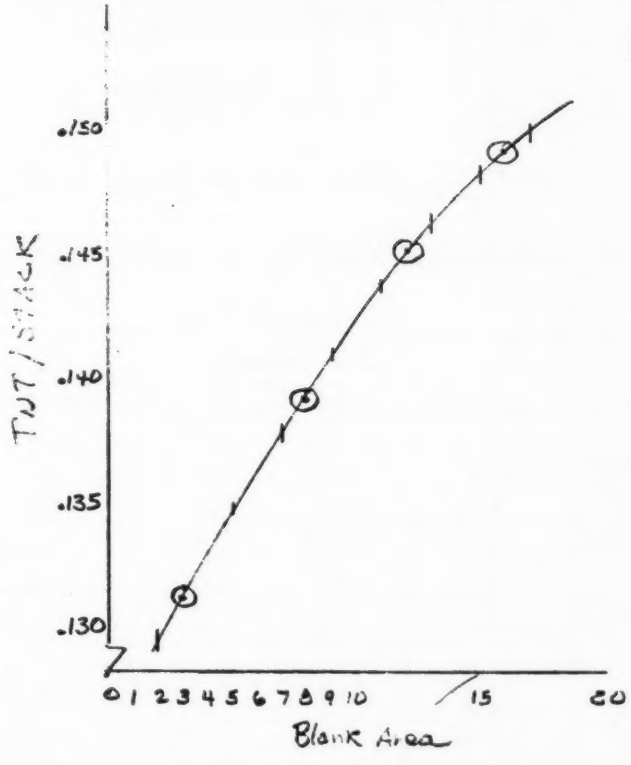
FIXED TRUE WORK TIME/1000 BOXES

Blank Area	Up to 3.999	4.000 - 9.999	10.000 - 15.999	16.000 - 21.999	22.000 & Over
TWT/1000	.30	.38	.50	.75	1.50

BUNDLING SUMMARY – CROSS TYING – 1 Knot Sec. I



NO	ELEMENT DESCRIPTION	Blank AREA up to 6 ft²	6–10 ft²	10–14 ft²	14–18 ft²
1	Set Stock Flat on Conveyor	.014	.017	.020	.022
2	Throw First loop around stack	.017	.020	.022	.023
3	Cross Twines & Make Second loop	.021	.023	.024	.025
4	Tie Standard Bundlers Knot	.079	.079	.079	.079
	TOTAL TRUE WORK/STACK	.131	.139	.145	.149



From Graph	TWT/Bale
up to 4 ft²	.129
4–6 ft²	.134
6–8 ft²	.138
8–10 ft²	.141
10–12 ft²	.144
12–14 ft²	.146
14–16 ft²	.148
16–18 ft²	.150
18–22 ft²	.151

Section #1

MTM ELEMENT ANALYSIS FILE NO ELEMENT #1

PRODUCT Stack of Taped Boxes
OPERATION Set the Stack Flat on the Bundling Conveyor

DATE 5/8/57 COMB/CALIPER A or B Flute NO PER BUNDLE Various
DEPT Finishing CONTAINER SIZE ___ X ___ X ___ OBSERVER JHC
MACHINE 2 Bar Universals SHEET SIZE ___ X ___
OPERATOR Norvell AREA Var WEIGHT approx 25#
REMARKS Stack is Vertical and Has been Jagged & Aligned

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
(A)		H-B		H-B		Move hands down edges of stack (Body assist from legs)
		mHIA	1.9	mHIA		Move inside of Arms against Edges of Stack
		HIBm 25/2	6.5	HIBm 25/2		Lift Bundle up from Conveyor (Body Assist from legs)
(B)		mM-ACD 25/2		mM-ACD 25/2		Rotate 90° from Vertical to Flat Pos. (Pull edge out over conveyor)
		RL2	0	RL2		Release Hands are not on the conveyor
(C)		R-Em		R-Em		Move Hands out from Sides of Stack
		Total	9.4	Constant TMU		

VARIABLE TMU

Blank Area

				up to 6½"	6-10½"	10-14½"	14-18½"
(A)		M-B		4"	8"	12"	14"
			TMU	6.9	10.6	13.4	14.6
(B)		mM-ACD 25/2		6"	8"	10"	12"
			TMU	10.2	11.9	13.4	15.0
(C)		R-Em		6"	10"	14"	16"
			TMU	5.1	7.6	10.1	11.3
		Total Variable		22.2	30.1	36.9	40.9
			+	8.4	9.4	9.4	9.4
TOTAL TMU/STACK				30.6	39.5	46.3	50.3
TRUE WORK/STACK TMU x .0006 x 75%				.014	.017	.020	.022

SHEET ___ OF ___

Section #1

MTM ELEMENT ANALYSIS FILE NO ELEHEUT #2

PRODUCT STACK OF TAPED BOXES
OPERATION Loop Twine around End of Bundle - parallel to Mfg's joint.

DATE 5/8/57 COMB/CALIPER A or B Flute NO PER BUNDLE Various
DEPT Finishing CONTAINER SIZE X X OBSERVER HMG
MACHINE 75 or Universal SHEET SIZE X
OPERATOR Norvell AREA Var WEIGHT approx 25#
REMARKS Stack is Flat on Conveyor with Front Edge approx 4" overhanging Conveyor
Loop Put on Right Side of Bundle

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
Reach to Twine in RH		mR16A	4.9	mM16A		Move Twine to LH
Grasp Tail End		G1A	2.0			
Move Twine down to conveyor (To Front and Side of Stack) Pulling out additional Twine	(A)	M-B		M-Bmv		Move Twine to conveyor (To Back and Side of Stack)
Hold			1.5	mM3Bmv		Tension Twine across Conveyor By pulling down
Start move			7.V	mM8B		Slide under Rear corner of Stack
Slide under Front corner		mM8Bmv	3.8			
Pull Twine around Top of Stack (pulling out more Twine)	(B)	mM-B5mv		M-B		Move Twine up to meet LH
		Total	19.4	Constant		TMU
						VARIABLE TMU
						Blank Area
				upto 6"V		6-10"V 10-14"V 14-18"V
	(A)	M-B		8"		10" 12" 16"
			TMU	10.6		12.V 13.4 15.8
	(B)	mM-B5mv		10"		14" 18" 20"
			TMU	7.5		10.9 14.3 16.0
		Total variable		18.1		23.1 27.7 31.8
			+	19.4		19.4 19.4 19.4
TOTAL TMU/STACK				37.5		42.5 47. 51.2
TRUE WORK/STACK TMU x .0006 x 75%				.017		.020 .022 .023

SHEET ____ OF ____

MTM ELEMENT ANALYSIS FILE NO ELEMENT #3 Section #1

PRODUCT STACK OF TAPED BOXES
OPERATION Cross Ropes & make Second loop around Bundle - Perpendicular to First loop

DATE 5/2/57 COMB/CALIPER Avr B Flute NO PER BUNDLE Various
DEPT Finishing CONTAINER SIZE X X OBSERVER JH6
MACHINE 7 Bar Universal SHEET SIZE X
OPERATOR Norvell AREA Var WEIGHT approx 25#
REMARKS Bundle has one loop

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
Move Top Twine to RH (Place in palm to right of Bottom Twine)		mvHIA	1.9	Hold		
Release Tail		(RL1)	2.0	G1A		Grasp Twine (Fore finger up) (RH now has both Twines)
Reach under Bottom Twine and Hook Index Finger over Top of Top Twine		RBB	10.1			
		G1A	2.0			Hold Twines
Move tail end of Twine across Stack		TBC1	18.6	TBC1		Move twine down to cover tail
		~~M-Bm~~		~~M-Bm~~		
Move Tail to other Twine		(M-B)		mvM-B (A)		Loop Twine under Stack and pull to tail End
		Total	34.6	Constant		TMU
						VARIABLE Blank Area up to 6H" 6H"-18H"
	(A)	mvM-B				i4" mvH38+ WIP (Bent)
			TMU			11.4 18.6
						+ 34.6 34.6
		TOTAL TMU/STACK				46.0 53.2
		TOTAL TWT/STACK				.021 .024
						me .023 .024 .025

SHEET _____ OF _____

MTM ELEMENT ANALYSIS SUMMARY FILE NO ELEMENT #1 Section #1

PRODUCT STACK OF TAPED BOXES
DATE 5/9/51 OPERATION
DEPT Finishing Tie the Standard Bundlers Knot
MACHINE 2 Box universals
OPERATOR
OBSERVER JNG CYCLE ONE KNOT

NO:	ELEMENT DESCRIPTION	ELEM. BASIS	TIME TMU	OCCUR/ CYCLE	TOTAL PER CYCLE
(1)	JOIN The TWINES	Knot	4.9	1/1	4.9
(2)	CROSS TWINES		5.4		5.4
(3)	GRASP TAIL		6.3		6.3
(4)	LOOP TAIL OVER Forefinger		8.9		8.9
(5)	ENLARGE LOOP SIZE		7.4		7.4
(6)	GRASP TAIL Through loop		5.5		5.5
(7)	TIGHTEN KNOT		9.5		9.5
(8)	POSITION KNOT ON BUNDLE EDGE		12.3		12.3
(9)	LOCK KNOT WITH a loop		37.3		37.3
(10)	CUT TWINE		18.6		18.6

TOTAL TMU PER CYCLE 176.1
.00045 NECESSARY TIME PER CYCLE .079
SHEET OF

ELEMENT #4- Tie Standard Bundlers Knot

	Description LH	LH Motion	TMU	RH Motion	Description RH
(1)	JOIN THE TWO TWINES. Insert twine over right forefinger and under rest of fingers.	M16A	4.9	(M3B)	Receive loose end of Twine. Hold both Twines
		Total	4.9		
(2)	ROTATE HAND CROSSING TWINES				
	Start Reach Release End	(RL1)	5.4	T90°S	Rotate hand so that knuckles are facing up and Tail end of Twine is Trailing to the right
		Total	5.4		
(3)	GRASP TWINE				
	Reach under right hand to approximatly 3" from End of loose end	R4B	4.3		Hold Twines
	Grasp loose End	G1A	2.0		
		Total	6.3		

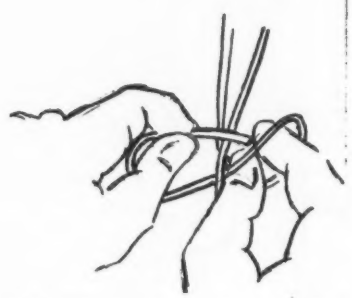
Section #1

ELEMENT #4 - Tie Standard Bundlers Knot - Con't

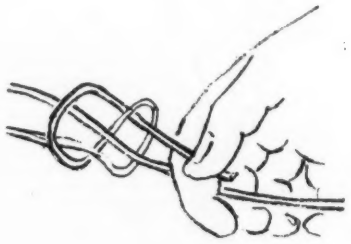
	Description LH	LH Motion	TMU	RH Motion	Description RH
(4)	LOOP TAIL OVER FOREFINSER				
	Pull twine over Top of right foretinger forming looseloop around foetinger				
	Pull Twine under two twines that go to Bundle	M6B	8.9		Hold Twines
		Totals	8.9		
(5)	ENLARGE LOOP SIZE				
	Allow enlargement of loop	(M7B)	4.6	M2B	Lift right forefinger as tha pointing
				~~M7B~~	Release twine with thumb but twine is held with ins! 3 fin pos
	Hold loose End of Twine		2.8	~~M~~ 11C	Move thumb up between loop along side of forefinger in pinching position.
		Total	7.4		

Section #1

ELEMENT #4 - Tie Standard Bundlers Knot - con't

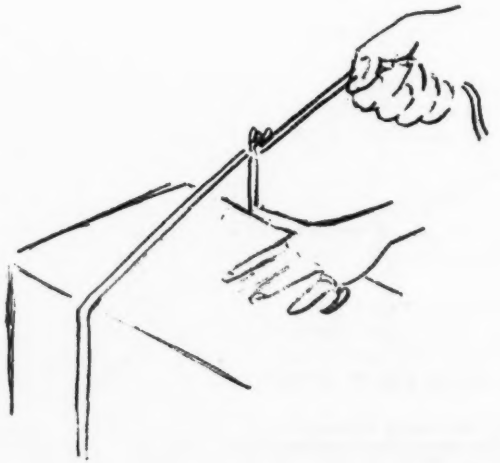


	Description LH	LH Motion	THU	RH Motion	Description RH
⑥	GRASP TAIL THRU LOOP				
	Move end of Twine over Top of 2 twines that go to Bdle and in between thumb and Foretinger (inside loop)	M4A	3.5	(H+B)	Receive twine Between thumb and foretinger.
	Release end of twine	(RL1)	2.0	G1A	Pinch twine between Foretinger and thumb
		Total	5.5		
⑦	TIGHTEN KNOT				
			2.0	M5B	Pull twine thru loop while loop is sliding off thumb and foretinger
	Place Hand on Bundle to Hold	(R4B G5)	5.0	M5B	Pull until Knot is tightly Tight
	Place thumb on Twine coming from Bottom of Bundle	R1B G5	2.5 0		
		Total	9.5		



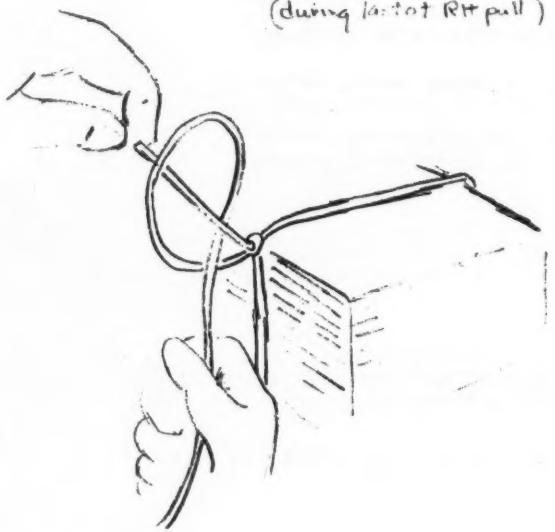
ELEMENT #4 - Tie Standard Bundlers Knot - Cont

	Description LH	LH Motion	TMU	RH Motion	Description RH
(8)	POSITION KNOT ON BUNDLE EDGE Hold Stock		0	R1.7V	Release tail of Twine
			5.7	M6Bm ~~M3E~~	Slip Hand down Twine Forefinger out of way
		(M2B)	14.4	1C1D m ~~M3B~~ m	Wrap Twine once around Back of Hand (above fingers)
	Release pressure - Allow Twine to play out under Thumb	(M2B)	10.0	m M1E	Pull rope up Sliding Knot over and above Bundle edge
	Push Twine back to Stock	(M1A)	4.3	M4Bm	Pull rope down
	Clamp twine on edge of Stock	API	16.2V		
			3.5	m M1A	Pull rope down snugly positioning Knot on Bundle edge.
			16.2V 2.0	API M3A	Draw Knot Tight
		Total	72.3	TMU	



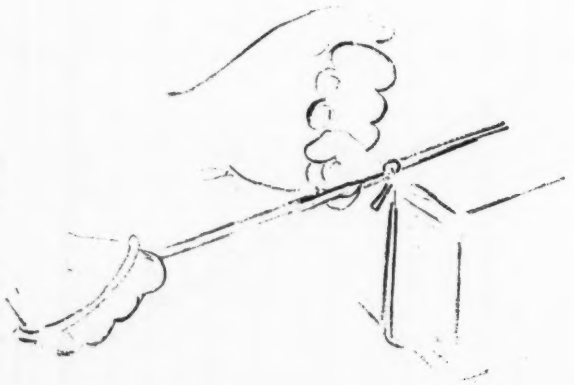
ELEMENT #4 - Tie Standard Bundlers Knot - Cont'

	Description LH	LH Motion	THV	RH Motion	Description RH
(9)	LOCK KNOT WITH A LOOP				
	Release Holding Bundle	RL2	0		Hold
	Reach with palm down to point on twine between Right and Right Hand (must be over thumb)	R4B	4.3		
		G5	0		Hold
	Move Twine down to start wrap around Fingers Hold loop	M1B	1.7		Hold
			15.2	M15B	Wrap twine loosely around First three fingers of LH
	Move loop to tail end of twine on knot Spread Fingers	M4C	6.0		
		~~M2B~~			
	Grasp Tail end with Thumb and Forefinger (loop slips off Fingers) Release Tail (during last of RH pull)	~~G1A~~			
		(RL1)	8.1	M16B	Pull Twine so that loop locks Knot
		Total	37.3		



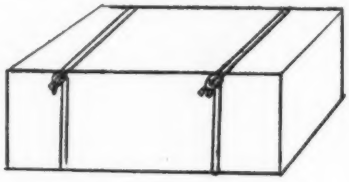
ELEMENT# ... - Tie Standard Bundlers Knot - Cont'

	Description LH	LH Motion	TMU	RH Motion	Description RH
(10)	CUT TWINE				
	Rotate hand Counter Clockwise so that ring finger hooks under rope twice to form knot	T60°S G5	6.5		
	Cut rope	M1B5 D2E	4.6 7.5	M1B5 D2E	Pull down on rope.
		Total	18.6		

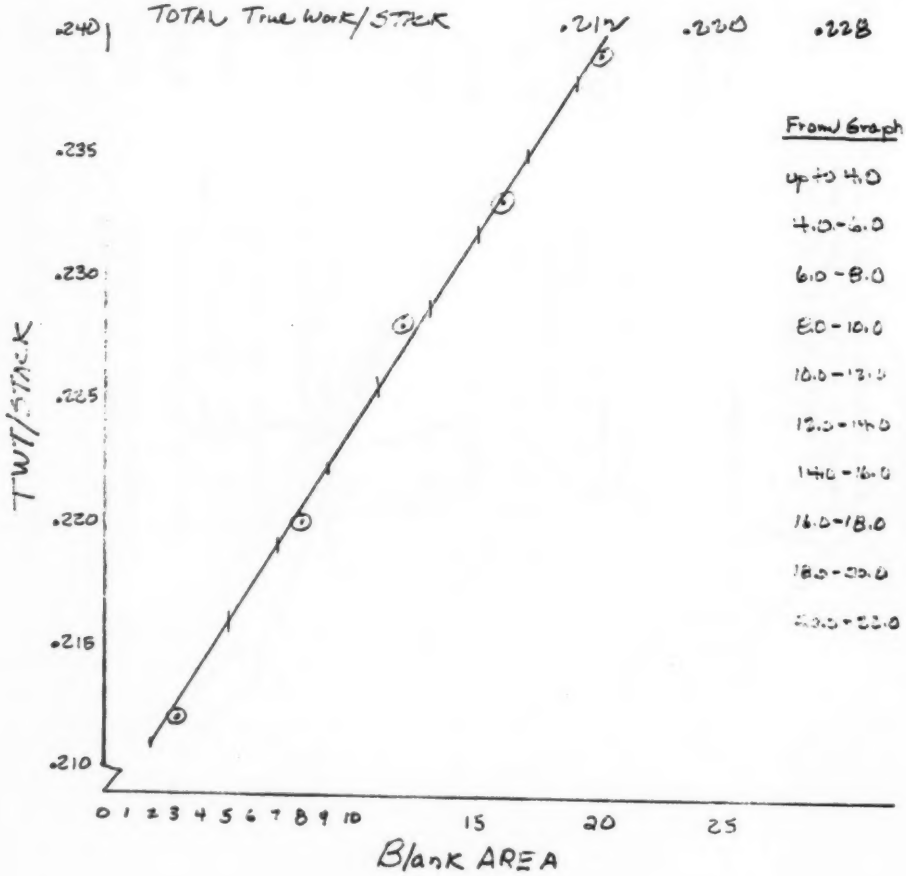


5/13/57

BUNDLING SUMMARY - Tie V Tunnes one way - 2 Knots Sec# II



NO	ELEMENT DESCRIPTION	Blank Area Up to 4" V	6-10" V	10-14" V	14-18" V	18-22" V *
1	Set Stack Flat on Conveyor (See EL#1 Sec#1)	.014	.017	.020	.022	.024
2	Throw First loop around Stack - Right (See EL#2 Sec#1)	.017	.020	.022	.023	.024
3	Tie Standard Bundlers Knot (See EL#4 Sec#1)	.079	.079	.079	.079	.079
4	Throw Second loop around Stack - Left	.023	.025	.028	.030	.033
5	Tie Standard Bundlers Knot (See EL#4 Sec#1)	.079	.079	.079	.079	.079
	TOTAL TIME WORK/STACK	.212	.220	.228	.233	.239



From Graph	TWT/Stack
up to 4.0	.211
4.0-6.0	.216
6.0-8.0	.219
8.0-10.0	.222
10.0-12.0	.225
12.0-14.0	.229
14.0-16.0	.232
16.0-18.0	.235
18.0-20.0	.238
20.0-22.0	.241

* Extrapolation

Section II

MTM ELEMENT ANALYSIS FILE NO ELEMENT #4

PRODUCT STACK OF TAPED BOXES
OPERATION Place Second Loop around Bundle

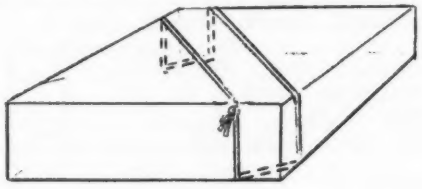
DATE 5/13/57 COMB/CALIPER AorB Plate NO PER BUNDLE Various
DEPT Finishing CONTAINER SIZE X X OBSERVER [illegible]
MACHINE 2B or Universal SHEET SIZE X
OPERATOR Norvell AREA Var WEIGHT approx 25#
REMARKS Second loop is put on left side of stack

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
Reach to Twine in RH		mwR6A	4.9	mwM6A		
Grasp Twine		G1A	2.0			
Move Twine down to conveyor (To Front & Side of Stack)	(A)	M-B		(M-Bmw)		Move Twine to conveyor (To Back and side of stack)
			4.3	mwM4B		Extra Move due to LH Position
			3.6	M3Bmw		Tension Twine across conveyor by pulling down
			7.2	mwM8B		Slide under rear corner of stack
Slide under Front Corner		M8Bmw	7.2			
Pull Twine around Top of stack (pulling out additional Twine)	(B)	mwM-B5		M-B		
		Total	29.2	Constant TMU		
				VARIABLE TMU		
		up to 6"		6-10"	10-14"	14-18" 18-22"
(A) M-B		14"		16"	20"	24" 28"
	TMU	14.6		15.8	18.2	20.6 23.1
(B) mw M-B5mw		10"		14"	18"	20" 22"
	TMU	7.5		10.9	14.3	16.0 20.2
TOTAL VARIABLE		22.1		26.7	32.5	36.6 43.3
	+	29.2		29.2	29.2	29.2 29.2
Total TMU/STACK		51.3		55.9	61.7	65.8 72.5
TRUE WORK/STACK TMU x .0006 x 75%		.023		.025	.028	.030 .033

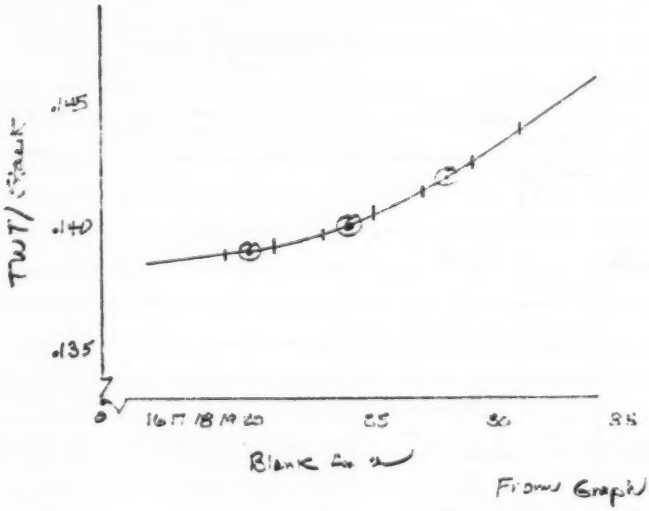
SHEET _____ OF _____

5/14/57
JHO

BUNDLING SUMMARY – Corner Tying – 1 Knot Set



NO	ELEMENT DESCRIPTION	18-22"	Blank Area 22-26"	26-30"
1	Set Stack down Flat on Conveyor	.019	.020	.020
2	Hook loop of Twine (returned) opposite Stack Corner	.041	.041	.041
3	Tie Standard Bundler Knot	.079	.079	.079
	Total True Work Time/Stack	.139	.140	.140



From Graph

Blank Area	TWT/Bale
18.0 – 20.0	.138
20.0 – 22.0	.139
22.0 – 24.0	.140
24.0 – 26.0	.140
26.0 – 28.0	.141
28.0 – 30.0	.142
30.0 – 32.0	.143

Section III

MTM ELEMENT ANALYSIS FILE NO ELEMENT #1

PRODUCT STACK OF WAXED BOXES
OPERATION Set Stack down Flat on Conveyer

DATE 5/14/57 COMB/CALIPER A or B Flute NO PER BUNDLE Var
DEPT Finishing CONTAINER SIZE X X OBSERVER SHB
MACHINE 2 Bar universals SHEET SIZE Var X
OPERATOR AREA Var WEIGHT Approx 25#
REMARKS Stack is vertical RH is on right edge, LH is on Top

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
Release Top Edge		RL1 R6Bm	13.8	M6B1V		Move Right Edge up
Reach under Bottom	(2)	R-3		Hold		
Grasp		G1A	2.0	Hold		
Set Stock Flat		(M-A)		M-Bm1V (3)		Set Stock Flat (Leaving at least 3" over edge)
		Hold		RET R2E		Move Hand out of way
		Total	15.8	CALCULATE THU		
						VARIABLE
						13-20" 21-28" 29-36"
	(4)	R-3				12" 14" 16"
			THU			10.1 11.5 12.9
	B	M-Bm1V				14" 16" 18"
			THU			16.6 18.1 21.0
		TOTAL VARIABLE THU				26.7 29.6 34.9
				+		15.8 15.8 15.8
		TOTAL THU/STACK				42.5 45.4 48.7
TRUE WORK TIME/STACK = THU x .0006 x 75%						.019 .020 .022

SHEET _____ OF _____

Section III

MTM ELEMENT ANALYSIS FILE NO ELEMENT #2

PRODUCT STACK OF TAPED BOXES
OPERATION Hook Front corner of stack with loop of twine, Pull out and loop under opposite corner

DATE _____ COMB/CALIPER _____ NO PER BUNDLE _____
DEPT _____ CONTAINER SIZE ___ X ___ X _____ OBSERVER _____
MACHINE _____ SHEET SIZE _____ X _____
OPERATOR _____ AREA _____ WEIGHT _____
REMARKS _____

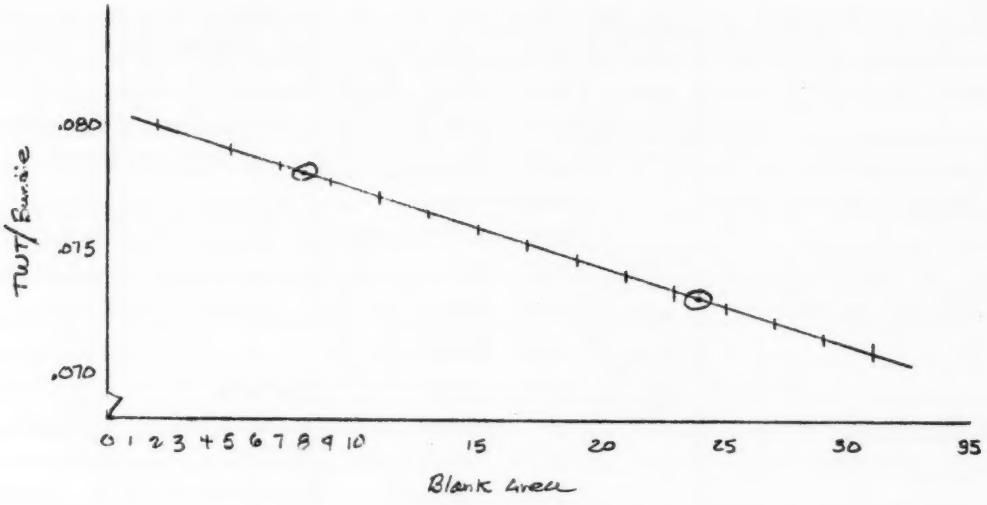
DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
		B	29.0	B		
Grasp end of twine		~~B6A~~		~~B6A~~		
		~~M~~				
Pull out twine		~~M~~ B				
		AB	31.9	AB		
Hook corner		~~M6B~~		~~M6B~~		Hook corner
Pull out twine		~~M~~ B		~~M~~ B		Pull out twine
		S^{2}C1	17.0	S^{2}C1		
Continue Form loop		~~M~~ C		~~M~~ C		Continue Form loop diagonal
Hold Tail			12.8	w/ M6B		Wrap twine under corner of bundle to LH
		Total	90.7	TMU		
TRUE WORK/WORK = TMU			.OH			

SHEET _____ OF _____

5/15/57 JHB

Section IV

BUNDLING SUMMARY - A Side Bundle to Skid & return



From Graph

Blank Area	TWT/Bdle
up to 4.0	.080
4.0 - 6.0	.079
6.0 - 8.0	.078
8.0 - 10.0	.078
10.0 - 12.0	.077
12.0 - 14.0	.076
14.0 - 16.0	.076
16.0 - 18.0	.075
18.0 - 20.0	.075
20.0 - 22.0	.074
22.0 - 24.0	.074
24.0 - 26.0	.073
26.0 - 28.0	.073

MTM ELEMENT ANALYSIS FILE NO Section IV

PRODUCT Bundle of Taped Boxes
OPERATION Aside Bundle to Pallet and return

DATE 5/15/57 COMB/CALIPER A or B Flute NO PER BUNDLE Various
DEPT Finishing CONTAINER SIZE X X OBSERVER MB
MACHINE 2B or Universals SHEET SIZE X
OPERATOR AREA WEIGHT approx 25#
REMARKS Blank size up to 16#

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
		R6B	8.6	R6B		Reach to Bundle
		G1A	2.0	G1A		Grasp
		M6B 25/2	13.8	M6B 25/2		Lift up from Bundling Conveyor
			18.6	TBC 11"		Carry Bdle to Pallet
			30.0	W2P		" " " "
			8.5	W1PO	50%	Additional pace to carry Bundle to Back 1/2 of Pallet
			7.3	B or S	25%	Bend or Stoop to Position on pallet
		MBC	11.8	MBC		Final Position on Pallet
		PISE	5.6	PISE		" " " "
		RL1	2.0	RL1		Release
			8.0	AB or AS	25%	Arise from Bend or Stoop
			8.5	W1PO	50%	Additional Pace to return from Back 1/2 of Pallet
			18.6	TBC 11"		Return to Bundling Conveyor
			30.0	W2P		
		Total	173.3			
True Work Time/Bdle = TMU x .0006 x 75%			.078			

SHEET 1 OF 2

MTM ELEMENT ANALYSIS FILE NO Section IV

PRODUCT BUNDLE OF TAPED BOXES
OPERATION A side Bundle to pallet and return

DATE 5/15/57 COMB/CALIPER A or B Flute NO PER BUNDLE Various
DEPT Finishing CONTAINER SIZE ___ X ___ X ___ OBSERVER FMG
MACHINE 2 Bar Universals SHEET SIZE ___ X ___
OPERATOR ___ AREA ___ WEIGHT Approx 25#
REMARKS Blank Size over 16"²

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
Reach to Bottom of Bdle		R6B	11.5	R10B		Reach to Side of Bdle
Grasp		G1A	2.0	G1A		Grasp
		M6B 2.5	18.8	M1VB 2.5		Lift up from Bundling Conveyor
			18.6	TBC11V		Carry Bundle to pallet
			30.0	W5VP		" " " "
			7.3	B or S	25%	Bend or Stoop to position on pallet
		M5C	9.1	M5C		Final Position on Pallet
		P1SE	5.6	P1SE		" " " "
		RL1	2.0	RL1		Release
			8.0	AB or AS	25%	Arise from Bend or Stoop
			18.6	TBC1		Return to Bundling Conveyor
			30.0	W5VP		" " " "
		Total	161.6			

True Work Time/Bdle = TMU x .0006 x 75% .073

SHEET V OF V

5/17/57
JHG

FIXED ELEMENTS IN BUNDLING Section V

	TWT/Pallet
(1) obtain and position empty pallet	.207
(2) Move completed pallet down conveyor (See unitizing Sec. III-C)	.153
Total	.360

44" x 60" pallet - Bales or Boxes stacked 60" high

open Blank Area	Boxes/load	TWT/1000	
upto 4.0 ft²	1200	.30	.30
4.0 - 6.0	960	.38	.33
6.0 - 8.0	960	.38	.36
8.0 - 10.0	960	.38	.40
10.0 - 12.0	720	.50	.45
12.0 - 14.0	720	.50 ↔	.50
14.0 - 16.0	720	.50	.56
16.0 - 18.0	480	.75	.65
18.0 - 20.0	480	.75 ↔	.75
20.0 - 22.0	480	.75	.88
22.0 - 24.0	240	1.50	1.04
24.0 - 26.0	240	1.50	1.23
26.0 - 28.0	240	1.50 ↔	1.50
28.0 - 30.0	240	1.50	1.50
30.0 - 32.0	240	1.50	1.50

MTM ELEMENT ANALYSIS FILE NO Section V

PRODUCT BUNDLES OF TAPED BOXES
OPERATION obtain and place wooden pallet on conveyor

DATE 5/17/57 COMB/CALIPER NO PER BUNDLE
DEPT Finishing CONTAINER SIZE X X OBSERVER
MACHINE 2 Bar Universal SHEET SIZE X
OPERATOR AREA WEIGHT
REMARKS Pallet Size 44" x 60" Weight 110#

DESCRIPTION - LEFT HAND	F	MOTION	TMU	MOTION	F	DESCRIPTION - RIGHT HAND
			18.6	TBC11V		Walk to Stack of Pallets
			45.0	W3D		" " " " "
			14.5	B or S	50%	Bend or Stoop to reach
		R6B	3.6	R6B		Reach to edges of Pallet
		G1A	2.0	G1A		Grasp
		AP1	16.4	AP1		Apply pressure
		M14B SD 2V	27.8	M14B SD 2V		Pull away from stack
			34.0	W4PO		Step back (pulling) to allow
						one edge to fall on floor
			16.0	AB or AS	50%	Raise upon edge
		G2	5.6	G2		Regrasp
			105.0	W7P		Drag to Floor Conveyor
		M6B SD 2V	16.4	M6B SD 2V		Position on Floor Conveyor (drop it)
			29.0	S		Align on Floor Conveyor
			10.1	RBB		Reach to Edges
		G1A	2.0	G1A		Grasp
		M10C SD 2V	26.4	M10C SD 2V		Pull to Straighten
		RL1	2.0	RL1		Release
			31.9	AS		Arise
			18.6	TBC11V		Return to Bundling Conveyor
			30.0	W4P		" " " "
			459.7			
True Work Time: TMU x .0006 x 75%			.207			

SHEET 1 OF 1

ROBINS AIR FORCE BASE, GA., Aug. 9 -- STUDY COST REDUCTION TECHNIQUES -- Graduates of the second Methods-Time Measurement course to be given at Robins AFB are shown at a ceremony at which they received MTM Association certificates of recognition. Col. John van O. Weaver, (right), WRAMA Maintenance Engineering Director, awarded the certificates. Graduates are (left to right, first row) Maynard L. Melton, Edgar M. Rutledge, Leroy C. Whitaker, Harvey A. Brown, J. Edwin Donnan (instructor), James C. Hammock, Thomas E. Foster, William P. Vance, Howard H. Binkley, and Walter D. Ferguson. Second row, left to right, are Johnson C. Moore, Felix D. Powell, Thomas Griffin, Ralph F. Cox, Frank R. Carlson, Albert H. Morrison, Tom W. Turner, James C. Sanderson, Griffin R. Beatty, and Robert H. Germany. (Official USAF photo)

1907 - USAF GOLDEN ANNIVERSARY - 1957

OFFICE OF INFORMATION SERVICES
Hq, Warner Robins Air Materiel Area
Robins Air Force Base, Georgia

FOR IMMEDIATE RELEASE

ROBINS AFB EMPLOYEES STUDY COST REDUCTION TECHNIQUES

ROBINS AIR FORCE BASE, GA., Aug. 9 -- Twenty-one Robins Air Force Base civilian personnel have successfully completed the second course to be given at the base in Methods-Time Measurement.

Col. John van O. Weaver, Maintenance Engineering Director for the Warner Robins Air Materiel Area, awarded MTM Association certificates of recognition to the graduates in a ceremony held in his office.

"In learning methods techniques, I hope that you will come up with some valuable ideas as to how we at Robins can reduce costs," Col. Weaver stated.

The MTM technique for cost reduction, an aid in production increases, gives predetermined time values for all manual motions and makes it possible to set accurate performance standards prior to production operations.

The technique was developed and is being widely used in the United States and Canada. It has also spread to Europe, Latin America, and the Far East. WRAMA is a member of the MTM Association. All trained personnel are expected to use this technique in furthering the WRAMA Maintenance Engineering Management Project.

Maintenance employees who completed the 105-hour course are Charles L. Faulk, Maynard L. Melton, Thomas Griffin, Edgar M. Rutledge, Leroy C. Whitaker, Frank R. Carlson, and Harvey A. Brown.

Others are James C. Hammock, Thomas E. Foster, Ralph F. Cox, Howard H. Binkley, Walter D. Ferguson, Charles E. George, Johnson C. Moore, Robert H. Germany, Felix D. Powell, and William P. Vance.

Supply graduates are Albert H. Morrison and Tom W. Turner. Personnel employees completing the course include James C. Sanderson and Griffin R. Beatty.

J. Edwin Donnan, chief industrial engineer of the Engines and Accessories Branch of Maintenance, was instructor for the course.

CHAPTER NEWS

MTM ASSOCIATION OF OHIO
Cincinnati, Ohio

The September 30, 1957, meeting was held at the Hotel Alms in Cincinnati.

Mr. James Kershner, of the Serge A. Birn Company, spoke on the rather important subject of "Fitting the Right Man to the Right Job." This subject dealing with modern methods of job selections and placement was one which has been of paramount importance when considering maximum utilization of manpower in industry.

MTM ASSOCIATION OF SOUTHERN CALIFORNIA
Los Angeles, California

The October 9, 1957, meeting was held in the Roger Young Auditorium. Benjamin Borchardt, MTM Association President, and Charles A. Bogenrief, a Director of the National Association, and Department Head, Industrial Engineering and Plant Engineering at Grayson Controls Division of Robertshaw-Fulton Controls Company, presented a resume of the latest happenings in regard to Association activities, and high lights and his general impression of the Sixth Annual International MTM Conference held in New York City in late September.

The main speaker of the evening was Donald L. Wheeler, Industrial Engineering Supervisor at Grayson Controls Division, who spoke on the subject of "How to Sell MTM to Supervision."

ST. LOUIS CHAPTER
St. Louis, Missouri

James R. Brauer, President of the Chapter, has conducted an appreciation course in MTM at the October meeting and will continue through the November meeting. This has been an opportunity for interested persons to gain much knowledge about MTM, and to learn the basic fundamentals of Methods Time Measurement.

RESEARCH REPORTS

R.R. 101 Disengage

This report contains a preliminary study of the element disengage. While it is still classified as tentative, the report contains some extremely interesting conclusions on the nature and theory of this element.

R.R. 102 Reading Operations

The first step in the use of MTM for establishing reading time standards is contained in this report. In addition, the report contains a synopsis of the work done in this field by 11 leading authorities.

R.R. 104 MTM Analysis of Performance Rating Systems

A talk presented at the SAM-ASME Time and Motion Study Conference, April 1952. It contains an analysis of performance rating systems and various performance Rating Films from an MTM standpoint.

R.R. 105 Simultaneous Motions

This report represents almost two man-years' work on a study of Simultaneous Motions. It is a final report of the Simultaneous Motions project undertaken by the MTM Association. While it does not purport to provide complete and exhaustive answers to all problems in the field of Simultaneous Motions, it presents a great deal of new and valuable information which should be of interest to every MTM practitioner.

R.R. 106 Short Reaches and Moves

This report contains an analysis of the characteristics of Reaches and Moves at very short distances. It develops important conclusions concerning the application of MTM to operations involving these short distance elements.

R.R. 107 A Research Methods Manual

The research activity of the Association has developed an effective and comprehensive set of methods for carrying on research in human motions. This report details the major techniques used. Adequate sources of motion data, film analysis, data recording, and statistical methods of analysis are among the topics discussed.

R.R. 108 A Study of Arm Movements Involving Weight

In this report, the results of a large investigation into the effect of weight on the performance times of arm movements are presented. While more effective means of determining correct time allowances for moving weights are given, the comprehensive discussion of the whole area of weight phenomena is probably of more fundamental importance. The effect of such conditions of performance as the use of one or two hands, sliding vs. spatial movements, and male and female performance are among the topics presented.

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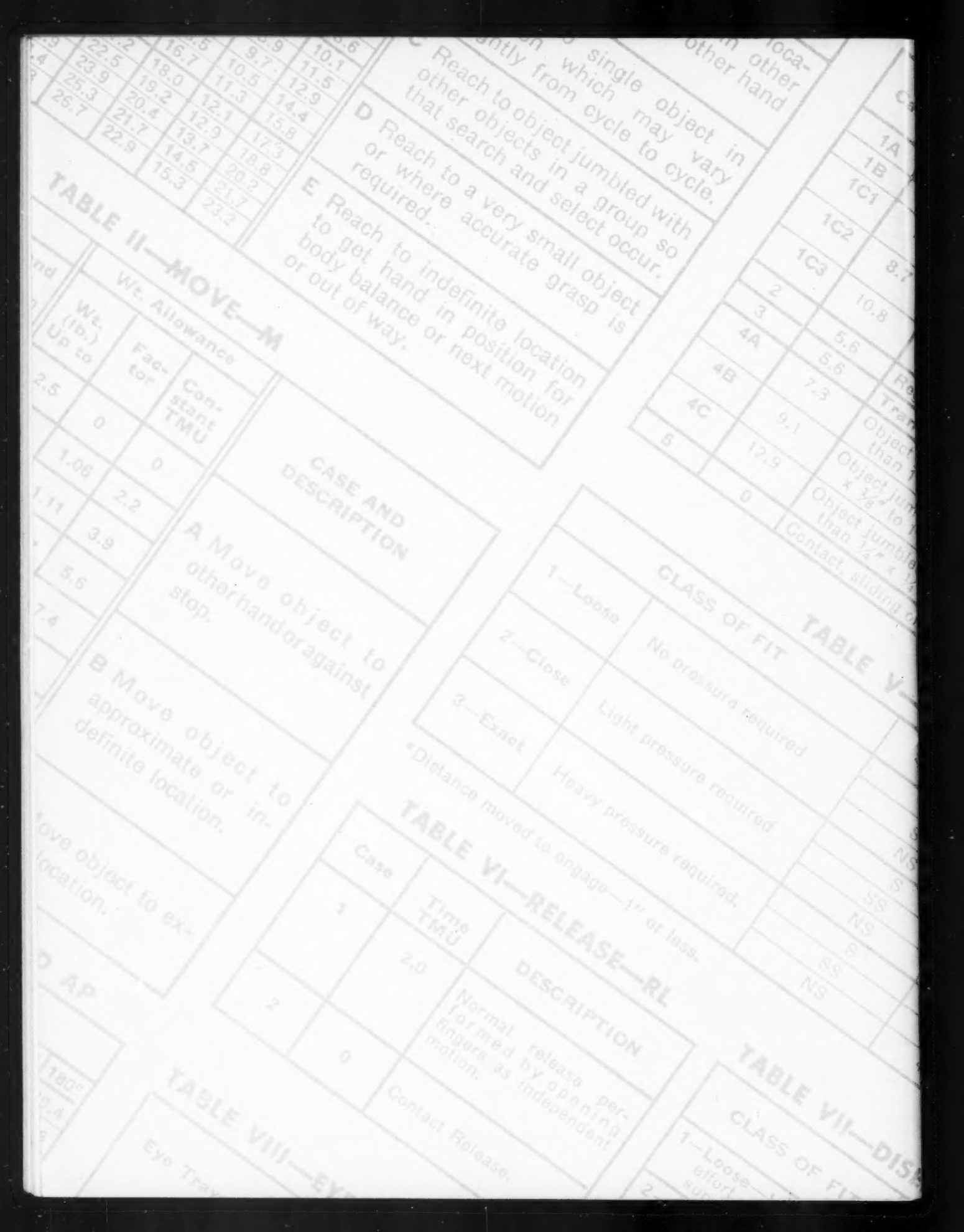
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